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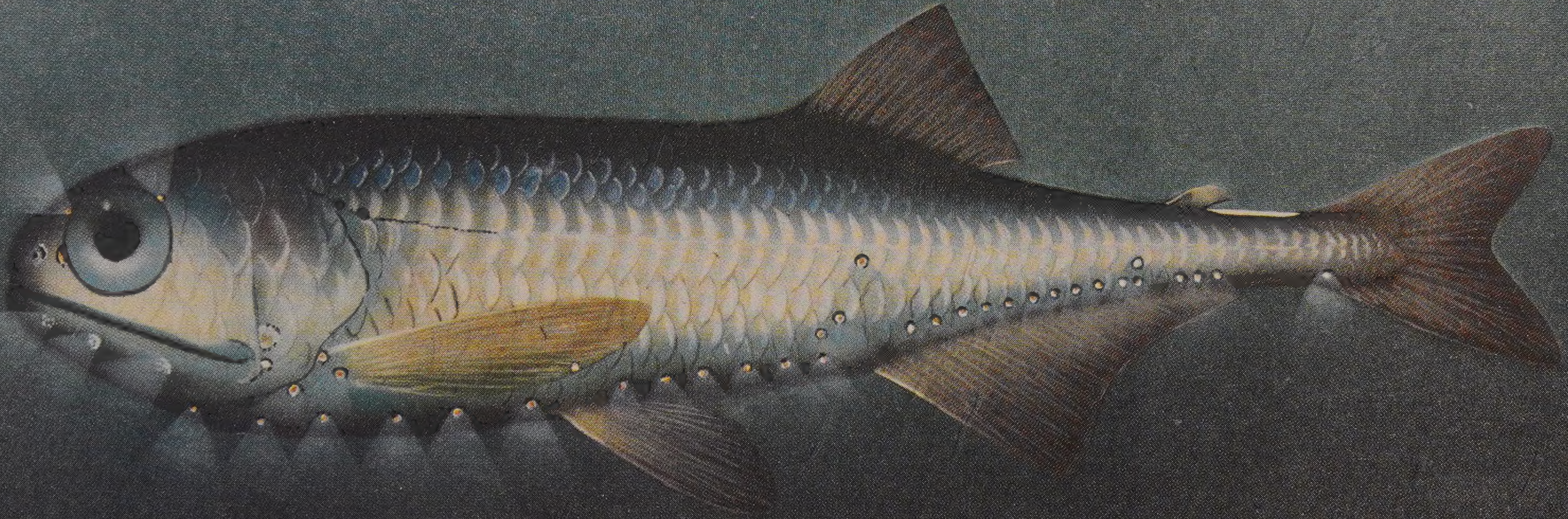
FIGURE 1. Tarletonbeania crenularis (Jordan and Gilbert) 1880.



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THE HON. THE MINISTER OF FISHERIES

BULLETIN No. LXVIII
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FISHES OF THE PACIFIC COAST OF CANADA

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BY

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OTTAWA
1949

FISHES OF THE PACIFIC COAST OF CANADA

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University of British Columbia

PREFACE

The aim of the authors has been to provide a concise and generally useful publication for both scientific and non-scientific persons interested in the marine fishes of the Pacific coast of Canada. The difficulty of attempting to meet all needs and desires will be realized. Since fishes occupy an aquatic habitat, collections and observations present certain difficulties and the accumulation of knowledge requires considerable effort and time. The information assembled in the following pages represents the results of the patient endeavours of many students over a long period of years. Much remains to be obtained and it is hoped that this account may be the means of stimulating the study of the fishes of British Columbia waters, particularly in regard to distribution and life histories.

ACKNOWLEDGEMENTS

The work was commenced at the Pacific Biological Station at Nanaimo, British Columbia, and to the Fisheries Research Board of Canada the authors wish to express their appreciation and thanks for facilities provided and the allotment of funds for the preparation of the illustrations. The authors also wish to make grateful acknowledgement to the University of British Columbia for facilities given and a grant from research funds to aid with a portion of the work.

To the following they extend their sincere thanks for much and varied assistance: Mr. G. J. Alexander, Provincial Fisheries Department, Victoria, B.C.; Dr. H. B. Bigelow, Harvard University, Cambridge, Mass.; Dr. R. L. Bolin, Scripps Institution of Oceanography, La Jolla, Cal.; Dr. G. C. Carl, Provincial Museum, Victoria, B.C.; Dr. W. M. Chapman, California Academy of Sciences, San Francisco, Cal.; Mr. H. A. Dunlop, International Fisheries Commission, Seattle, Wash.; Professor J. R. Dymond, Royal Ontario Museum of Zoology, Toronto, Ont.; Dr. R. E. Foerster, Pacific Biological Station, Nanaimo, B.C.; Dr. C. McLean Fraser, University of British Columbia, Vancouver, B.C.; Mr. E. G. Hart, Victoria, B.C.; Dr. J. L. Hart, Pacific Biological Station, Nanaimo, B.C.; Dr. C. L. Hubbs, Scripps Institution of Oceanography, La Jolla, Cal.; Mr. J. L. McHugh, Pacific Biological Station, Nanaimo, B.C.; Dr. G. C. Myers, Natural History Museum, Stanford University, Cal.; Mr. P. H. Nasmyth, North Vancouver, B.C.; Mr. F. Neave, Pacific Biological Station, Nanaimo,

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B.C.; Mr. J. R. Norman (deceased), British Museum, London, Eng.; Dr. A. L. Pritchard, Pacific Biological Station, Nanaimo, B.C.; Dr. L. P. Schultz, United States National Museum, Washington, D.C.; Mr. W. C. Schroeder, Harvard University, Cambridge, Mass.; Dr. L. A. Walford, Stanford University, Cal.; Mr. A. D. Welander, University of Washington, Seattle, Wash.; Mr. L. P. Woods, Field Museum, Chicago, Ill.; and the following firms in Vancouver, B.C.: British Columbia Packers Limited; Canadian Fishing Company Limited; Edmunds and Walker Limited; Shannon Brothers and Vancouver Shell Fish Company.

The authors have been fortunate in obtaining the services of Mr. F. L. Beebe for the preparation of the illustrations. These have been made under the direction of the authors, from actual specimens in the great majority of cases, otherwise from photographs and in a few instances as reconstructions from illustrations in publications by: D. S. Jordan and B. W. Evermann, E. C. Starks, R. L. Bolin and W. M. Chapman.

INTRODUCTION

The composition of the marine fish fauna of the Pacific coast of Canada is interesting in several respects. A few northern, or arctic, fishes have their southern limits of distribution on the British Columbia coast, as for example: the capelin, *Mallotus catervarius*, which spawns annually in Departure bay and which has only been reported occasionally from as far south as the vicinity of Victoria; the long-snouted Blenny, *Lumpenella longirostris*, which has been taken in Burrard inlet at Bedwell bay, the most southern record for the species; the crested sculpin, *Histiocottus bilobus*, known south of Alaskan waters in Dean channel, and the yellow-fin sole, *Limanda aspera*, which extends southward into northern British Columbia only.

On the other hand certain southern forms tend to reach their northernmost distribution on the British Columbia coast, notably the pilchard, *Sardinops caerulea*, which appears along the west coast of Vancouver island during the summer months. In some years numbers have been observed farther northward, even in Alaskan waters, but in general the northern range limit may be said to be cape Scott. On the west coast of Vancouver island five bottom forms, hitherto considered as distinctly southern, have been found, namely, the spotted kelp-fish, *Gibbonsia elegans montereyensis*; the striped kelp-fish, *Gibbonsia metzi*; the big-finned eel-pout, *Aprodon corteziana*; the warty sea-poacher, *Occa verrucosa*; and the slender cling-fish, *Rimicola eigenmanni*. A few individuals of pelagic fishes of southern distribution are taken occasionally, such as: the silvery hatchet-fish, *Argyropelecus olfersii*; the king-fish, *Genyonemus lineatus*; the skipjack, *Katsuwonus pelamis*; the albacore, *Thunnus alalunga*; the California pompano, *Peprilus simillimus*; the barracuda, *Sphyraena argentea*; the ocean sun-fish, *Mola mola*; and the whale-sucker, *Remilegia australis*.

Several unique fishes living at great depths along this coast have become known as the result of the voyages of the *Albatross* and the work of the International Fisheries Commission. Among these may be mentioned the deep-sea skate, *Raja abyssicola*, obtained at a depth of 1,588 fathoms off the Queen Charlotte islands; the abyssmal liparid, *Careproctus ovigerum*, also from the same depth and locality; the barrel-eye, *Macropinna microstoma*, to a depth of 487 fathoms; the bulb-fish, *Oneirodes Bulbosus*, from over 379 fathoms.

Four species have been introduced from eastern points: the shad, *Alosa sapidissima*, in 1871 into the Sacramento and Columbia rivers, reaching Canadian waters off Vancouver island in 1876; the Atlantic salmon, *Salmo salar*, in 1905 and subsequently; the speckled char, *Salvelinus fontinalis*, in 1908 and later; the brown trout, *Salmo trutta*, in 1932, 1933 and 1934. The latter three species have been liberated in lakes and streams on Vancouver island but only the brown trout has been taken in salt water.

The number of species reported herein is 245. Of these 24 were described from types taken in British Columbia waters, as follows: the deep-sea skate, *Raja abyssicola*; the barrel-eye, *Macropinna microstoma*; the fanged viper-fish, *Chauliodus macouni*; the smooth-scaled grenadier, *Dolloa cyclolepis*; the filamented grenadier, *Chalinura filifera*; the rough-scaled grenadier, *Macrurus acrolepis*; the brown sea-perch, *Brachyistius brevipinnis*; the large-scaled goby, *Rhinogobiops nicholsii*; the arrow goby, *Clevelandia ios*; the Y-blenny, *Allolumpenus hypochromus*; the soft eel-pout, *Bothrocara mollis*; the cusk-pout, *Derepodichthys alepidotus*; the prow-fish, *Zaprora silenus*; the rough-spined sculpin *Prionistius macellus*; Taylor's sculpin, *Asemichthys taylori*; the manacled sculpin, *Synchirus gilli*; the tadpole sculpin, *Psychrolutes paradoxus*; the grunt-fish, *Rhamphocottus richardsoni*; the smooth sea-poacher, *Anoplagonus inermis*; the spiny lump-sucker, *Eumicrotremus orbis*; Günther's liparid, *Liparis cyclopus*; Green's liparid, *Polypera greeni*; the abyssmal liparid, *Careproctus ovigerum*; and the bulb-fish, *Oneirodes bulbosus*. The following have been obtained only in these waters: the deep-sea skate, *Raja abyssicola*; the smooth-scaled grenadier, *Dolloa cyclolepis*; the filamented grenadier, *Chalinura filifera*; the Y-blenny, *Allolumpenus hypochromus*; the cusk-pout, *Derepodichthys alepidotus*; Taylor's sculpin, *Asemichthys taylori*; the abyssmal liparid, *Careproctus ovigerum*; and the bulb-fish, *Oneirodes bulbosus*.

The fact that 77 families of fishes are represented indicates something of the varied character of the fauna. Undoubtedly records of additional species will be added in the future in view of the fact that some 50 species, other than those described herein, have been recorded from Washington or Alaska or both. Furthermore there is the likelihood of the discovery of a number of species new to science.

A HISTORY OF MARINE ICHTHYOLOGICAL COLLECTIONS ON THE PACIFIC COAST OF CANADA

The history of scientific recordings of western Canadian marine fishes begins with the voyage of H.M.S. *Herald* in the northern Pacific ocean. A pink salmon was obtained in Observatory inlet and was described in 1836 by Sir John Richardson as the type of a new species, *Salmo scouleri*. This scientific name later was found to be a synonym of *Salmo gorbuscha* Walbaum, predescribed in 1792. In 1861 the genus *Oncorhynchus* was proposed by Suckley to include the Pacific salmons so the scientific name of this species is now *Oncorhynchus gorbuscha* (Walbaum).

The first collections of any size to be made were obtained by various members of the staff and crew of H.M.S. *Plumper*, which was sent out from England under Lieut.-Colonel Hawkins to continue the geodetic survey of the north-eastern Pacific ocean begun by Captain Vancouver. From November, 1857, to January, 1861, collections of fishes were made and shipped to the British Museum under the auspices of the Lords of the Admiralty, particularly Lord, later Earl, Russell. The specimens, in many cases dried skins only, were studied by Dr. Albert Günther who described them in his *Catalogue of the Fishes in the British Museum*. The eight volumes were published between 1860 and 1870. (Five of Günther's types from British Columbia waters are still valid.)

In 1866 J. K. Lord published his *A Naturalist in Vancouver island and British Columbia*, in two volumes, in which he listed and described to some extent the fishes that he encountered in his capacity as naturalist on the British America Boundary Commission. Since these collections were deposited in the British Museum they also were studied and referred to by Dr. Günther.

In 1880 Drs. D. S. Jordan and C. H. Gilbert collected and made observations in and around Victoria and recorded their findings in 1881.

In 1881 and 1882 Captain H. E. Nichols, U.S.N., commander of the U.S. Coast and Geodetic Survey vessel *Hassler* made rather extensive collections of shore and shallow-water fishes along the central and northern portions of the British Columbia coast, areas from which very few specimens have been obtained since, resulting in the discovery of three new species and many first records of species for these waters. The collections were recorded in 1881 and 1883, respectively, by Dr. T. H. Bean and are deposited in the United States National Museum at Washington, D.C.

In 1885 Dr. G. M. Dawson collected in the Queen Charlotte sound area and the fishes obtained were recorded in 1887 by J. F. Whiteaves.

Under the auspices of the U.S. Fisheries Commission the survey steamer *Albatross* was built and commissioned for the collection of marine flora and fauna and equipped for operations at great depths. After some preliminary work in the Atlantic ocean the vessel began a series of collections on the Pacific coast with the purpose of obtaining information on the fishing potential of the Pacific ocean. In 1888 a voyage was made in northern waters and upon the return trip from Alaska three successful hauls were made off the Queen Charlotte and Vancouver islands. In 1890, while en route from Alaska to California, a single haul was completed off Moresby island at a depth of 1,588 fathoms providing a remarkable collection of deep-sea fishes. In 1891 many trawl hauls were made in the Juan de Fuca strait area, twelve of which were in Canadian territorial waters and fishes were obtained at ten of these stations. In 1903 fourteen stations were worked in the strait of Georgia and in Queen Charlotte sound, from which fishes were obtained at ten. In addition to the trawling and dredging operations many shore collections also were made in these waters. The fishes collected in 1888 were recorded in 1891 by T. H. Bean; those taken in 1890 and 1891 were recorded in 1895 by C. H. Gilbert, for the most part, and the 1903 collections were recorded in 1907 by B. W. Evermann and E. L. Goldsborough. All specimens obtained are now in the collections of the United States National Museum. From these *Albatross* collections several type specimens were obtained, two species of which have not since been taken.

The first extensive collections of fishes to be made by a Canadian in British Columbia waters were those of Mr. Ashdown Green, a civil engineer, who collected in the vicinity of Victoria. He published his records in 1891 and 1893 in the *Proceedings of the British Columbia Natural History Society*, the first volume of which (1891) has been out of print for many years and only a few copies are extant. Mr. Green's contribution to the literature included some nine first records for the Province and in recognition of his discovering a liparid new to science Drs. D. S. Jordan and E. C. Starks honoured him by naming it *Neoliparis greeni*, now known as *Polypera greeni*. Mr. Green's collections were the nucleus of the fish collection of the Provincial Museum at Victoria.

In 1898, John Fannin, first curator of the Provincial Museum, listed the fishes in the Museum, largely collected by Mr. Green, and added eight new records.

In 1900 a considerable shore collection was made on the Queen Charlotte islands and this was listed in 1901 by W. H. Osgood, United States Department of Agriculture, Biological Survey, on the identification of Mr. Edmund Heller.

On September 8 and 9, 1908, and from May to August, 1909, Messrs. C. H. Young and W. Spreadborough collected at Departure bay and on Barkley sound in the vicinity of Ucluelet, adding several new distribution records. The results of these collections, and some miscellaneous ones by Dr. G. M. Dawson, Messrs. J. H. Keen and A. Halkett, and Prof. E. E. Prince, were recorded in 1920 by B. A. Bean and A. C. Weed, and the specimens obtained are now in the United States National Museum.

During the years from 1912 to 1923 Dr. C. McLean Fraser made observations on a number of fishes in the Departure bay area and laid the foundations of the fish collection at the Pacific Biological Station. From 1924 to 1940, the present authors added to this collection and accumulated information which is now incorporated in this publication.

In 1928 Professor J. R. Dymond collected extensively along the south portion of the east coast of Vancouver island and the fishes are now in the Royal Ontario Museum of Zoology. The records have generously been made available to the authors.

Between 1929 and 1932 the International Halibut Commission made extensive tow-net hauls at considerable depths in the vicinity of the west coasts of Vancouver and the Queen Charlotte islands in search of the eggs and young of the halibut. Many fishes were obtained and these were recorded in part in 1939 and 1940 by W. M. Chapman, who described several species new to science in the 1939 publication. The type specimens are now in the United States National Museum and the remainder are in the collections of the International Fisheries Commission at Seattle, Washington.

In 1927 and 1930 Dr. H. C. Williamson recorded observations on sharks and rays and several fishes which he had seen at various points along the coast of British Columbia, chiefly along the west coast of Vancouver island.

In 1933 and 1934 the second author collected extensively in the vicinity of Nanaimo, English bay and in Burrard inlet. In the last two regions several new first records were obtained and are recorded herein. The collections are now in the Museum of the University of British Columbia.

In 1934 and 1935, through the cooperation of the Canadian Hydrographic Service, accommodation was arranged on the survey ship *Wm. J. Stewart* for a biologist and an oceanographer from the Pacific Biological Station. In the former year, operations were carried out off the west coast of Vancouver island and Mr. E. G. Hart supervised the collections of fishes and invertebrates, taken in shore-seines, dredge and trawl hauls and by shore collecting in tide-pools. Altogether 623 fishes were taken, extending the known distribution of many and adding eight new records for the Province. In 1935 the biological collection was continued under the direction of Dr. C. McLean Fraser in the Queen Charlotte islands area and 166 fishes were added to the *Wm. J. Stewart* collections.

For the most part the collections mentioned above have been quite extensive numerically. In addition a considerable number of isolated records have been published by various persons, and the present text includes twenty species not previously reported as occurring in western Canadian marine waters.

EXTERNAL CHARACTERS

Selachians and fishes are recognized by certain external characteristics. In referring to the various parts and describing their differences it is necessary to use definite terms. The glossary on page 340 gives the meanings of these terms as used in this text and should be referred to in all cases of doubt in using the key or the text.

Diagrams (figs. 2-7) on succeeding pages show the parts referred to in the descriptions which follow.

The following descriptions of certain parts are given to assist in the use of the key and of the specific descriptions which follow.

MEASUREMENTS

The measurements given in the text such as: Length of body; length of head; tip of snout to origin of dorsal fin, etc., are the distances between the vertical projections from these points, not over the curvature of the body or head.

Length of fish—standard. The distance from the tip of the snout, not including the premaxillaries when protracted, to the end of the vertebral column.

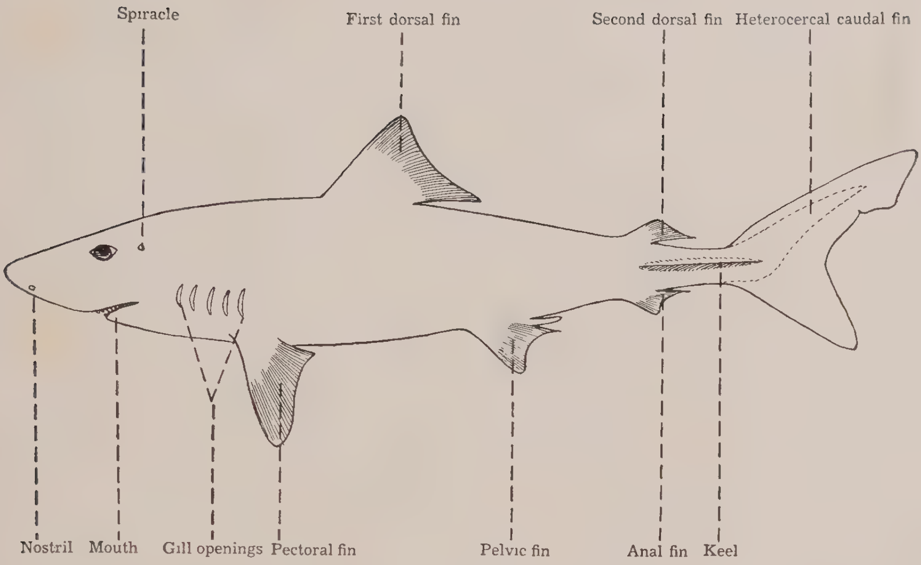
Spiracle
First dorsal fin
Second dorsal fin
Heterocercal caudal fin
Nostril
Mouth
Gill openings
Pectoral fin
Pelvic fin
Anal fin
Keel

FIGURE 2. A hypothetical shark showing the external characters.

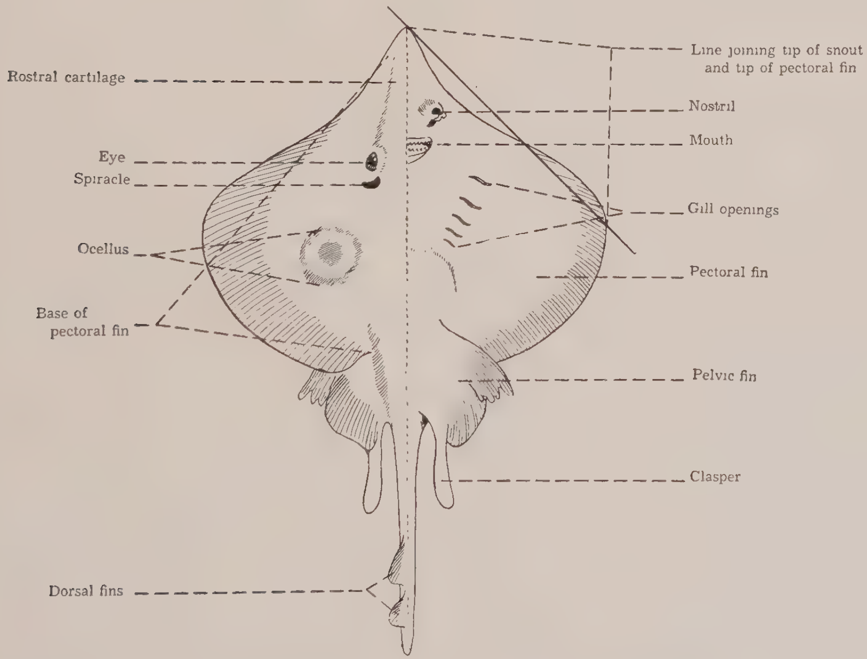
Rostral cartilage
Eye
Spiracle
Ocellus
Base of pectoral fin
Dorsal fins
Line joining tip of snout and tip of pectoral fin
Nostril
Mouth
Gill openings
Pectoral fin
Pelvic fin
Clasper

FIGURE 3. A hypothetical skate. Dorsal view on left. Ventral view on right.

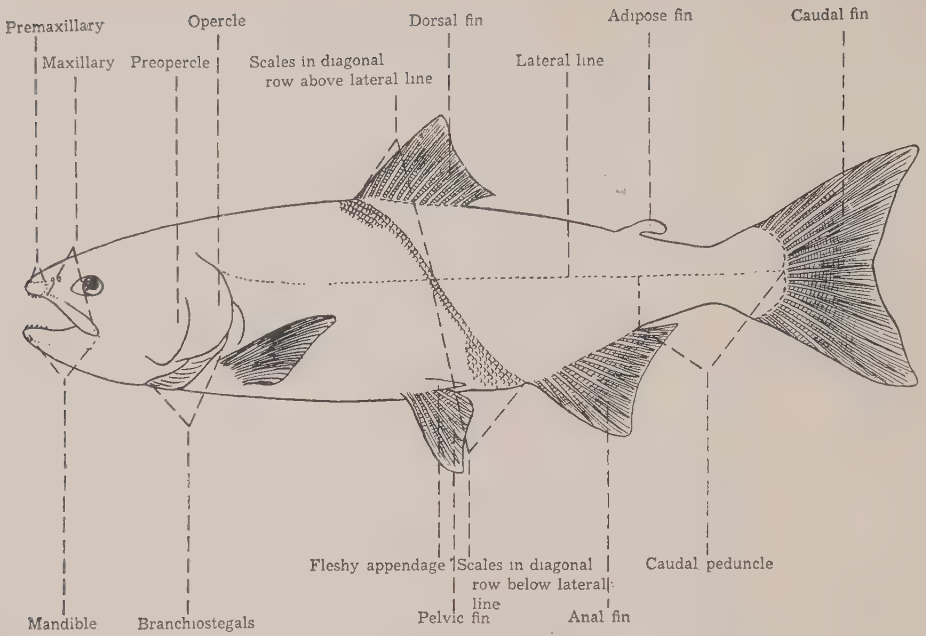
Premaxillary
Maxillary
Preopercle
Opercle
Scales in diagonal row above lateral line
Dorsal fin
Lateral line
Adipose fin
Caudal fin
Mandible
Branchiostegals
Fleshy appendage
Pelvic fin
Scales in diagonal row below lateral line
Anal fin
Caudal peduncle

FIGURE 4. A hypothetical salmon showing the external characters.

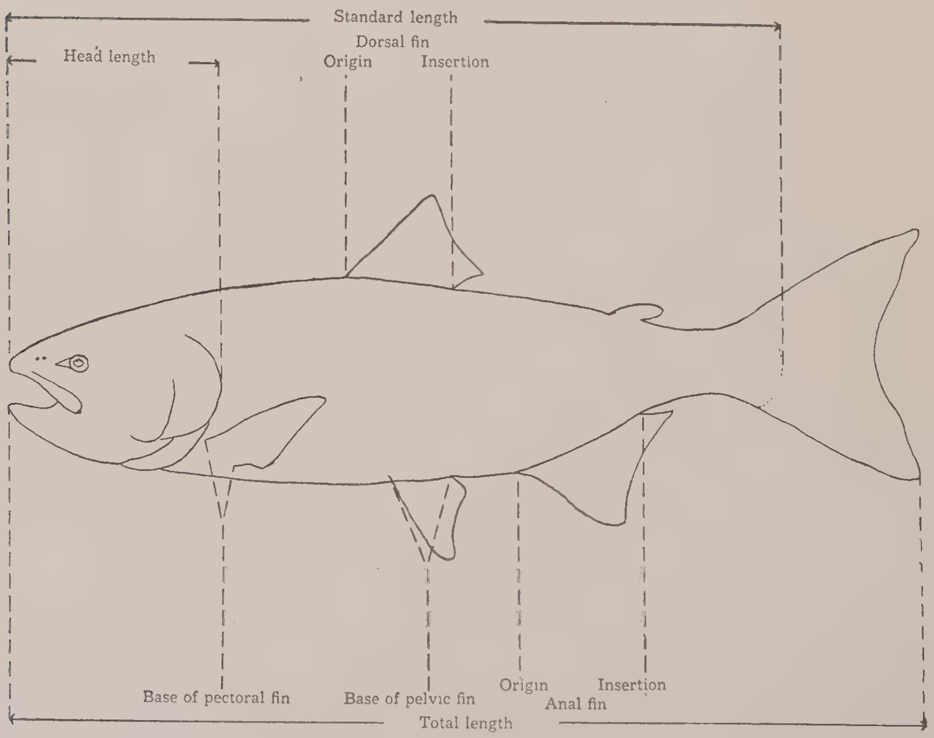
Standard length
Head length
Dorsal fin
Origin
Insertion
Base of pectoral fin
Base of pelvic fin
Origin
Insertion
Anal fin
Total length

FIGURE 5. A hypothetical salmon showing methods of making measurements.

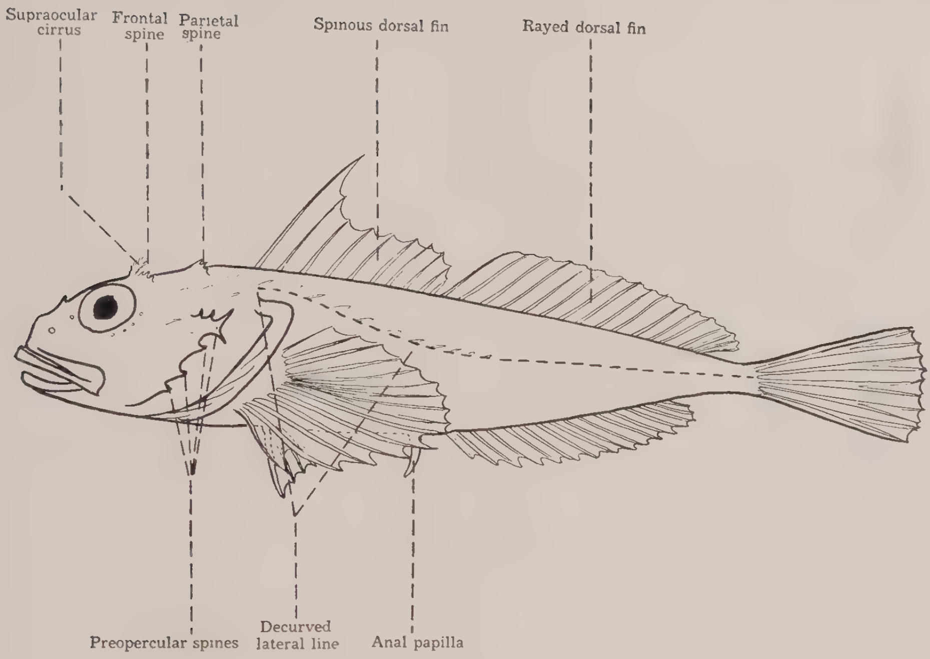
Supraocular cirrus
Frontal spine
Parietal spine
Spinous dorsal fin
Rayed dorsal fin
Preopercular spines
Decurved lateral line
Anal papilla

FIGURE 6. A hypothetical sculpin showing external characters.

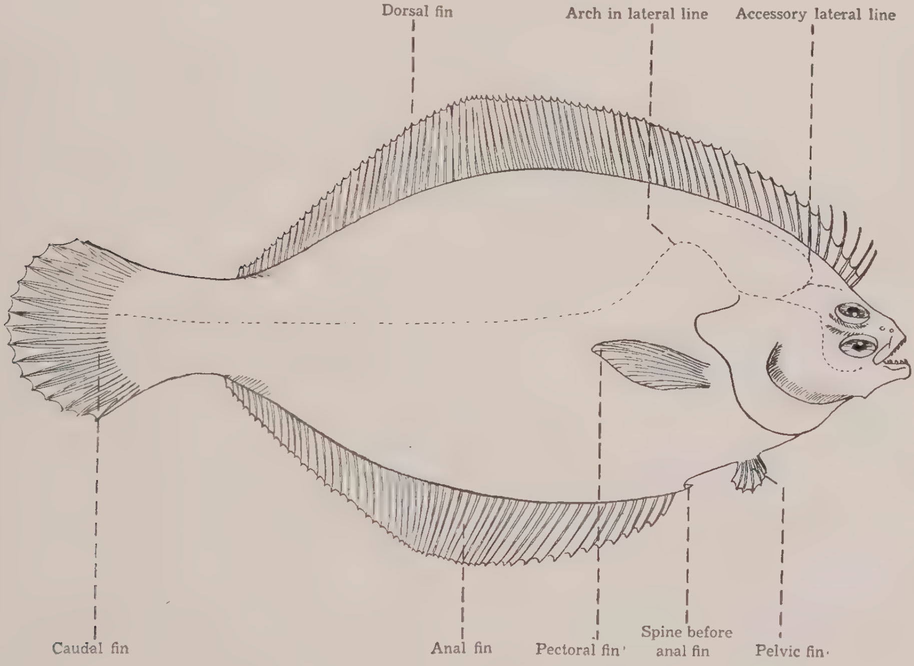
Dorsal fin
Arch in lateral line
Accessory lateral line
Caudal fin
Anal fin
Pectoral fin
Spine before anal fin
Pelvic fin

FIGURE 7. A hypothetical flounder showing external characters.

Length of fish—total. The distance between the verticals from the most anteriorly projecting part of the head and the most posterior portion of the body including the caudal fin, when present.

Length of head. The distance from the tip of the snout to the most posterior point of the opercular membrane.

Length of snout. The distance from the tip of the snout to the anterior margin of the orbit.

Length of upper jaw. The distance from the most anterior point of the premaxillary to the posterior point of the maxillary.

Length of fin. The length of the dorsal or anal fin is the distance between the origin and the insertion of the fin; the length of the pectoral, pelvic or caudal fin is the distance from the base to the tip of the longest ray.

Height of fin. The length of the longest ray or spine in the fin; applicable to the dorsal and anal fins.

FINS

I. PAIRED FINS

The paired fins of fishes, when present, are the pectorals and pelvics.

Pectoral fins. These are situated, one on each side of the body, each close to the head and usually behind the gill opening or openings and are supported by a pectoral girdle. In the skates and rays the pectoral fins are greatly expanded while the gill openings are ventral. In one family, the Oneirodidae, the pectoral fins are in front of the gill openings.

Pelvic fins. These occur in various positions on the lower surface of the body, on each side of the midventral position, in front of the anus. They are called ventral fins by some authors.

In the more generalized types of fishes the pelvic fins are situated in the posterior half of the region between the pectoral girdle and the anus and supported by a pelvic girdle. These are said to be *abdominal* in position, e.g., herrings, salmons, trouts, etc.

In many of the fishes the pelvic fins have their bases under, or almost under the pectoral fins, with the pectoral and pelvic girdles attached or in close proximity. They are then said to be *thoracic* in position, e.g. cods, mackerels, barracudas, rock-fishes, sculpins, flounders, etc. Some of the fishes in this group have the pelvic fins united to form a hollow cone, e.g. gobies. In some fishes the pelvic fins are united and modified into a flattened adhesive disk, e.g. lump-suckers and liparids, while in others the pelvic fins are united and, together with a fold of skin from the ventral surface of the body, form a laterally-cleft adhesive disk, e.g. cling-fishes.

II. VERTICAL FINS

The vertical fins of fishes are the dorsal, the anal and the caudal. In some species there may be a small fin behind the dorsal fin without rays called the adipose. In others there may be one or more finlets behind the dorsal and anal fins.

Dorsal fin. This may be in one or more portions, extending to a greater or lesser distance along the dorsal surface of the body. Fishes with the pelvic fins abdominal in position usually have a dorsal fin, or fins, composed of soft rays. In the majority of fishes with the pelvic fins thoracic in position the anterior portion of the dorsal fin is composed of more or less spinous rays. If two fins are present, the anterior fin usually is spinous.

In the Echeneidae the first dorsal fin is divided longitudinally and each half of the spine is depressed laterally, the whole fin forming part of an adhesive disk on the top of the head and the anterior portion of the dorsal surface of the body.

An extreme modification of the dorsal fin is found in the order Pediculati. Here the first spine of the dorsal fin consists of a single, elongate, complicated structure (the illicium), usually much divided at the tip and frequently luminous.

Anal fin. This, when present, lies along the posterior median ventral surface of the body. The origin usually is immediately behind the anus but in some species the anus occurs very much in advance of the fin, e.g. some liparids. Two anal fins may be present, e.g. cods.

Finlets. These occur on certain pelagic fishes such as the mackerels and usually are separate and pennant-shaped. Each is supported by a much divided ray and stream-lined by having the anterior margin thickened and the posterior portion thin and tapered.

Caudal fin. This, when present, is extremely variable in size and shape.

III. COUNTING FIN RAYS

In the enumeration of fin rays Roman numerals are used for spines, Arabic numerals for rays.

Dorsal fin. A simplified formula has been adopted, thus: dorsal (3), 11 to 13—16 to 18—12 to 14, indicates that there are three separate dorsal fins, the first with eleven to thirteen rays, the second with sixteen to eighteen, and the third with twelve to fourteen; dorsal (2), V - I, 9, indicates that there are two fins, the first composed of five spines, the second of a spine and nine rays; dorsal (1), XXI or XXII, 27 to 33, indicates that there is a single fin, the anterior portion of which is composed of twenty-one or twenty-two spines and the posterior portion of twenty-seven to thirty-three rays.

Anal fin. The fin formula is similar to that of the dorsal fin.

Pectoral fin. Counts are made of the rays from above downward.

Pelvic fin. When the fin is pulled forward counts are made from the anterior to the posterior margin, e.g. I, 5, indicates one spine and five rays. In some families, such as the Cottidae, the spine and the first ray are closely adherent and enclosed in a fold of skin so that the first ray may be overlooked if examination is not critical.

Caudal fin. Counts are made from the dorsal to the ventral margin, e.g. in the family Melamphaidae, III, 19, III, indicates three dorsal spines, 19 rays and three ventral spines.

THE LATERAL LINE

The lateral line, as its name implies, is usually in a longitudinal median position on the side of the body from the upper margin of the operculum to the base of the caudal fin. It is a tube and along it at more or less regular intervals are pores, sometimes at the ends of short tubes, which open from an internal series of sensory nerve endings. The function of the lateral line is the detection of vibrations of very low frequency. Apparently the movements of the fish produce vibrations which are reflected from its surroundings and the fish is thus able to avoid collisions.

In some species the lateral line may be high, following the dorsal contour of the body. In others, the lateral line may be strongly decurved continuing below the median position to or toward the caudal fin. Occasionally the lateral line may be extremely irregular and wavy, as in the Scombridae. A prominent arch may be present over the pectoral fin in some of the flat-fishes.

Some fishes have no visible lateral line. Others have it partially developed and others may have multiple lateral lines on each side of the body. In some of the blennies with multiple lateral lines there may be short vertical extensions, as in the Xiphisteridae.

An accessory dorsal branch may be present in some of the flat-fishes from above the gill opening extending along the base of the dorsal fin, in addition to which shorter branches may extend onto the head region.

SCALES

In selachians and fishes most species develop hard protective structures in the skin known as scales.

In the selachians the scales are in the form of "thumb-tack" plates, each usually with a spine, which may be straight upward from the plate or slightly curved backward. These scales are known as *placoid* scales. The placoid scale has a dentine base and spine derived from the dermis, the inner layer of the skin. The spine is capped, like a tooth, with hard enamel which develops from the epidermis, the outer layer of the skin. In fact, in sharks and skates, the scales are modified to form teeth. The separate scales do not overlap.

In the fishes the scales are derived entirely from the inner layer of the skin, the dermis, and are of two kinds. In the fishes of the subclass Palaeopterygii, represented by the sturgeons and other forms, and in the garpikes and bowfin of the subclass Neopterygii, the scales consist of a basal plate with a hard outer covering called ganoin and the scales are known as *ganoid* scales. In the sturgeons the scales are mostly large thick isolated scutes from which the ganoin has been lost but small ganoid scales often persist on the upturned portion of the tail.

In the fishes of the subclass Neopterygii, represented by the great majority of modern fishes, the scales, other than those mentioned above, lie in pockets of the skin with their posterior portions projecting posteriorly. These scales are usually overlapping, or imbricated, like shingles on a roof, and thin for flexibility and freedom of movement of the body. They are referred to frequently as "true" scales. These are of two types, *cycloid* and *ctenoid*, basically the same in origin and structure and sometimes both kinds are found on the same fish.

The cycloid scales have smooth posterior margins and are more frequently found in fishes with soft dorsal fin rays. The ctenoid scales have comb-like or spinous posterior margins and are more frequently found in fishes with hard, or spinous dorsal fin rays. In certain species, e.g. cottids, liparids, etc., the ctenoid scale may be much reduced in size becoming a mere rim with a spinous margin or even a single spine. These are known as *reduced ctenoid* scales.

Cycloid and ctenoid scales increase in area and thickness with the growth of the fish. In the majority of fishes the growth of a scale is marked by the formation of a more or less concentric series of ridges, known as *circuli*, which are especially evident on the portion within the scale-pocket. When growth is rapid the circuli are far apart and when growth is slow they are close together. When growth is arrested, as in winter conditions, the circuli are closely grouped and known as winter "checks." These winter checks are readily distinguishable in the salmons and several other species of fishes and are used in age determination.

COUNTING SCALES AND SCALE FORMULAE

The number of scales, as counted from one part of the body to another, is of value in the identification of many fish species and enumeration is made as follows:

Scales on lateral line. The number of scales on the lateral line, from above the opercular opening to the base of the caudal fin.

Scales in oblique rows above midline of body. Counted from the operculum to the base of the caudal fin.

Scales in first row above lateral line. In certain groups the scale count on the lateral line is impractical or difficult to make so the count of the first longitudinal row above is used.

Scales in diagonal row above lateral line. Usually in a diagonal row from the origin of the dorsal fin to the lateral line, downward and backward.

Scales in diagonal row below lateral line. Usually in a diagonal row from the origin of the anal fin, upward and forward to the lateral line.

Scale formula. A conventional formula "scales 7 + 70 + 11," would indicate seven scales in a diagonal row above the lateral line, seventy in the lateral series and eleven in a diagonal row below the lateral line.

CIRRI

Cirri (singular, cirrus), are fleshy extensions of the skin and may be simple, bifid, multifid, etc. They are distributed on various parts of the head and body. The principal locations on the head are designated as follows:

Nasal. In the region of the nostril.

Preocular. Above and before the middle of the eye.
Supraocular. Above the middle of the eye.
Postocular. Above and behind the eye.
Occipital. In the occipital region.
Maxillary. On the posterior end of the maxillary.

BONES AND SPINES OF THE HEAD AND HEAD REGION

In the rock-fishes, certain of the bones of the head and anterior portion of the body immediately behind the head may bear spines which penetrate through the skin to the outside. The first series of bones is composed of the nasal, the prefrontal, the frontal and the parietal, along the top of the head from the snout to the anterior portion of the body. The nasal is small, forming the anterior portion of the snout region, and bears a single spine; the prefrontal is small, lying immediately in front of the eye, and bears a single spine; the frontal extends from the anterior margin of the orbit to a short distance behind the orbit and bears the frontal and median frontal spines; the parietal lies behind the frontal and usually bears a single spine at the posterior end of a long ridge. A second series of bones extends from behind the posterior margin of the eye, the sphenotic and pterotic bones, each of which may bear spines. These are in line with the anterior portion of the lateral line. At the anterior end of the lateral line are two bones which form part of the pectoral girdle. The upper is the supracleithrum which may bear one or two spines, and the lower is the cleithrum, usually bearing one spine, occasionally two. On the posterior margin of the gill cover is a bone, the operculum, with two slightly diverging spines, the opercular spines. The curved bone immediately in front of the operculum, is the preoperculum, on which are five spines, the preopercular spines. Below the eye and extending partly behind it is a series of three suborbital bones. The third of these forms a more or less prominent bony structure which reaches to the preoperculum and is referred to as the "bony stay." This usually is not observable without dissection. The first bone of this series is the lacrymal which usually is expanded in an antero-posterior direction, the lower margin lying immediately above the maxillary bone. In some species the lower margin of the lacrymal bone may be enlarged to form one or two distinct lobes which may bear spines.

LOCATION OF SPINES IN THE HEAD REGION (FIG. 8)

Nasal. Immediately above the nostril.
Prefrontal. At the upper anterior margin of the orbit (preocular—of authors).
Frontal. Along the upper margin of the orbit and immediately behind. One to three may be present behind the prefrontal spine to a short distance behind the eye, designated as frontals I, II, III. Frontal I (supraocular), above posterior margin of pupil. Frontal II (postocular), above posterior margin of orbit. Frontal III (tympanic), immediately behind frontal II.
Median frontal. Between the midline of the frontal bone and the margin of the orbit, usually on a well defined ridge. When present, varying from a single

spine at the posterior end of the ridge to numerous rugosities along the whole ridge (coronal).

Parietal. Usually on the posterior end of an elongate ridge behind and slightly median to the frontal series. The parietal ridge frequently is slightly curved away from the midline of the head posteriorly and the spine is approximately at a point midway between the upper posterior margin of the eye and the origin of the dorsal fin. In a few species a second parietal spine may be present (nuchal).

Sphenotic. At the posterior margin of the orbit.

Pterotic. Immediately behind the sphenotic.

Supracleithral. Immediately above the anterior end of the lateral line. In some species two spines may be present.

Cleithral. Immediately below the anterior end of the lateral line. Sometimes two spines may be present.

Opercular. Near the posterior tip or margin of the operculum, usually two spines are present.

Preopercular. On the posterior margin of the preoperculum. Five spines usually are present, sometimes the fifth very small, and in some species the individual spines may be multifid.

Lacrymal. At the lower anterior margin of the eye on the lacrymal bone. The lower margin of the bone may have one or two lobes on which spines occur. Usually not more than one on the anterior lobe but one to several on the posterior (preorbital).

For convenience the spines on one side only of the head are used but it must be remembered that they are really paired.

For the identification of fishes, "keys" are used. In these the identity of a specimen is determined by the "true and false" method. The first statement in the key is considered. If it applies exactly to the specimen, that is, is true, the second statement is considered. If this is correct, the next statement is taken and as long as the statements apply each succeeding statement is taken until a name is given at the end of the line. On the other hand, if the first statement does not apply, that is, is false, the alternative indicated by the number in brackets must apply. The number with its alternative statement is then located and the system continued with the true or false method until a name is given at the end of a statement when the identification is complete. No fish fits two alternatives in the key; every fish must fit one or the other. If a case arises where a fish does not seem to have the characters to fit either alternative, an error has been made and it is necessary to go back to the beginning and re-check each statement. After the specimen being examined is keyed carefully until a definite name appears at the end of a statement, reference should be made to the figure and description in the following portion of the book in order to verify the determination.

It may be pointed out that owing to the convenient use of the presence and absence of pelvic fins in the construction of the key, some families such as the Stichaeidae, Pholidae, Cottidae, Liparidae, etc., appear in two sections. The key therefore does not present a complete systematic arrangement of the families.

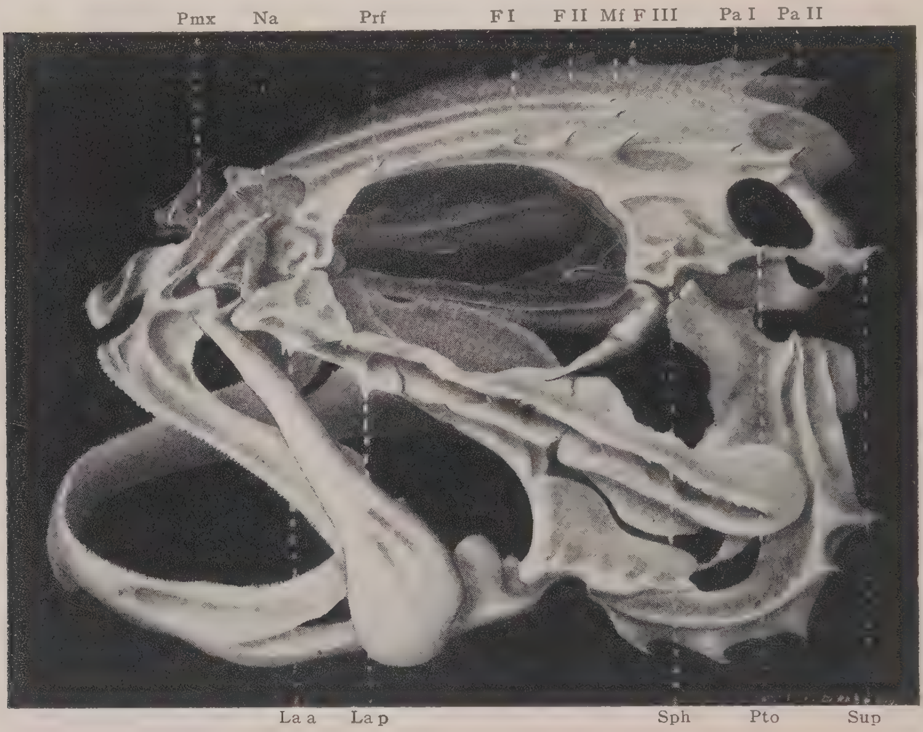

FIGURE 8. A hypothetical rock-fish skull showing the cranial spines. Pmx—premaxillary; Na—nasal; Prf—prefrontal; FI, II, III—frontals; Mf—median frontal; PaI, II—parietals; La a—anterior lacrymal; La p—posterior lacrymal; Sph—sphenotic; Pto—pterotic; Sup—supracleithral.

A KEY TO THE ADULT MARINE FISHES AND FISH-LIKE VERTEBRATES IN WESTERN CANADIAN WATERS

1 (4) Mouth in a circular sucking disk; jaws absent; nostril, 1, median.

2 (3) Gill pores on each side of body, 7, first close behind eye; eyes not covered with skin; barbels around mouth or nostril, none.

Family **PETROMYZONIDAE**—Lampreys

Pacific lamprey *Entosphenus tridentatus*

3 (2) Gill pores on each side of body, 10 to 14, first remote from eye; eyes covered with skin; barbels around mouth and nostril, 8, long.

Family **MYXINIDAE**—Hag-fishes

Hag-fish *Polistotrema stoutii*

4 (1) Mouth not in a circular disk; jaws present; nostrils, 2.
5 (38) External gill openings on each side of body, 5 to 7, or on ventral surface, in 5 pairs.
6 (25) External gill openings on each side of body, 5 to 7; pectoral fins not expanded at bases.
7 (10) Dorsal fin (1); external gill openings, 6 or 7.

Family **HEXANCHIDAE**—Cow sharks

8 (9) External gill openings, 7.
Spotted cow shark *Notorynchus cepedianus*

9 (8) External gill openings, 6.
Mud shark *Hexanchus griseus*

10 (7) Dorsal fins (2); external gill openings, 5.
11 (22) Anal fin present.
12 (17) Large keel on each side of caudal peduncle; *or*, if keels absent, caudal fin half total length of shark.

Family **LAMNIDAE**—Mackerel sharks

13 (16) Large keel on each side of caudal peduncle; caudal fin much less than half total length of shark.
14 (15) Gill slits moderate, first about equal in length to distance from tip of snout to posterior margin of eye; teeth large, sharp.
Mackerel shark *Isurus nasus*

15 (14) Gill slits very long, first more than twice as long as distance from tip of snout to posterior margin of eye; teeth very small.
Basking shark *Cetorhinus maximus*

16 (13) No keels on caudal peduncle; caudal fin about half total length of shark.
Thresher shark *Alopias vulpinus*

17 (12) No keels on caudal peduncle; caudal fin much less than half total length of shark.
18 (19) Anal fin large, length of base about twice that of first dorsal fin.

Family **SCYLLIORHINIDAE**—Cat sharks

Brown shark *Apristurus brunneus*

19 (18) Anal fin small, length of base much less than that of first dorsal fin.

Family **CARCHARINIDAE**—Blue sharks

20 (21) Length of pectoral fin only slightly greater than height of first dorsal fin, fin not sabre-shaped; black spot on each dorsal fin.
Soup-fin shark *Galeorhinus galeus*

21 (20) Length of pectoral fin twice height of first dorsal fin, fin sabre-shaped; no black spot on either dorsal fin.
Blue shark *Prionace glauca*

22 (11) Anal fin absent.

Family **SQUALIDAE**—Dog-fishes

23 (24) Large spine in anterior margin of each dorsal fin.
Dog-fish *Squalus suckleyi*

24 (23) No spine in anterior margin of either dorsal fin.

Sleeper shark *Somniosus microcephalus*

25 (6) External gill openings on ventral surface of body in 5 pairs; pectoral fins expanded at bases, each extending from snout to pelvic fin.
26 (37) Snout acutely pointed anteriorly.
27 (36) Body elongate posteriorly, not forming whip-like extension and without large spine above; dorsal fins (2), near tip.

Family **RAJIDAE** –Skates

28 (31) Outline between tip of snout and tip of pectoral fin concave so that a line drawn between these two points lies almost wholly without margin; snout supported by firm cartilage.
29 (30) Pelvic fins deeply notched when extended; colour on upper surface of body nearly plain brown, on lower surface, muddy blue.

Long-nosed skate *Raja rhina*

30 (29) Pelvic fins with slight concavity when extended; colour on upper surface of body brown to gray with scattered pale spots, large "eye-spot" surrounded by ring of light spots at base of each pectoral fin, on lower surface, nearly white.

Big skate *Raja binoculata*

31 (28) Outline between tip of snout and tip of pectoral fin more or less convex so that a line drawn between these two points lies almost wholly within margin; snout supported by weak cartilage.
32 (35) Spines present on shoulder girdle.
33 (34) Spines on shoulder girdle, about 6; on orbital rim, in row.

Prickly skate *Raja stellulata*

34 (33) Spines on shoulder girdle, 1 or 2; on orbital rim, none.

Black skate *Raja kincaidii*

35 (32) Spines on shoulder girdle, none.

Deep-sea skate *Raja abyssicola*

36 (27) Body greatly elongate posteriorly, forming whip-like extension with large sharp spine above; dorsal fins, absent.

Family **TRYGONIDAE**—Sting rays

Rat-tailed sting ray *Dasyatis dipterurus*

37 (26) Snout bluntly rounded anteriorly.

Family **TORPEDINIDAE**—Electric rays

Electric ray *Tetranarce californica*

38 (5) External gill opening on each side of body, 1.
39 (136) PELVIC FINS PRESENT.
40 (115) PELVIC FINS ABDOMINAL IN POSITION.
41 (42) Dorsal fins (2), spine at anterior margin of first dorsal fin stout, grooved, serrate; caudal fin long, lanceolate; pectoral fins large, paddle-shaped; teeth incisor-like, on

upper jaw, 4, on lower jaw, 2, formed by union of several teeth. (*The adipose fin of salmon, trout, etc., is not regarded as a dorsal fin in this key.*)

Family **CHIMAERIDAE**—Chimaeras

Rat-fish *Hydrolagus colliei*

42 (41) Dorsal fin (1), no spine at anterior margin (dorsal fin preceded by a series of bony plates in the silvery hatchet-fish); caudal fin not lanceolate; pectoral fins not paddle-shaped; teeth, if present, not incisor-like.

43 (114) Dorsal fin not followed by 5 or more free finlets.

44 (47) Bony shields on body, in 5 widely separated rows; mouth ventral, protrusible; barbels under snout, 4, in transverse row; upper lobe of caudal fin much longer than lower.

Family **ACIPENSERIDAE**—Sturgeons

45 (46) Lateral shields, 38 to 48; barbels nearer tip of snout than mouth; colour, gray.

White sturgeon *Acipenser transmontanus*

46 (45) Lateral shields, 23 to 30; barbels nearer mouth than tip of snout; colour, green.

Green sturgeon *Acipenser medirostris*

47 (44) No bony shields on body, mouth terminal or subterminal, not protrusible; barbels under snout, none; caudal fin, not as above.

48 (113) Base of dorsal fin shorter than head, rays in dorsal fin fewer than 26.

49 (92) Neither photophores nor luminous spots present.

50 (57) Dorsal fin not followed by adipose fin.

Family **CLUPEIDAE**—Herrings

51 (56) Mouth moderate, terminal.

52 (55) Large specialized scales on each side of tail, 2; striae on operculum; black spots on each side of body in row, conspicuous when scales removed.

53 (54) Body deep, much compressed; keels on ventral scutes, strong; striae on operculum coarse, radiating; round black spots on each side of body in row, usually visible when scales in place, decreasing in size posteriorly.

Shad *Alosa sapidissima*

54 (53) Body terete; keels on ventral scutes, weak; striae on operculum fine, almost parallel but slightly curved; round black spots on each side of body in row, sometimes not visible when scales in place, uniform in size.

Pilchard *Sardinops caerulea*

55 (52) No large specialized scales on either side of tail; no striae on operculum; no round spots on sides of body.

Herring *Clupea pallasii*

56 (51) Mouth large, subterminal.

Anchovy *Engraulis mordax*

57 (50) Dorsal fin followed by adipose fin.

58 (91) Eyes lateral, not directed upward; snout not broad or shovel-like.

59 (80) Fleshy appendage at base of each pelvic fin.

Family **SALMONIDAE**—Salmons

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60 (69) Rays in anal fin, 12 to 19.

Genus *Oncorhynchus*—Pacific salmons

61 (66) Large black spots on back and caudal fin.
62 (63) Spots on back and caudal fin, large; scales in first row above lateral line, 170 or more, small.

Pink salmon *Oncorhynchus gorbuscha*

63 (62) Spots on back and caudal fin, small, irregular; scales in first row above lateral line, fewer than 155, moderate.
64 (65) Black spots, when present on caudal fin, usually on upper lobe only; pyloric caeca, 45 to 80.

Coho salmon *Oncorhynchus kisutch*

65 (64) Black spots on both lobes of caudal fin; pyloric caeca, 140 to 185.

Spring salmon *Oncorhynchus tshawytscha*

66 (61) No large black spots on back or caudal fin, small black speckling usually present.
67 (68) Rakers on first gill arch, 19 to 26, short, stout, smooth, widely spaced.

Chum salmon *Oncorhynchus keta*

68 (67) Rakers on first gill arch, 30 to 39, long, slender, rough, closely set.

Sockeye salmon *Oncorhynchus nerka*

69 (60) Rays in anal fin, 8 to 12. (Trouts and chars.)
70 (77) Teeth on head and shaft of vomer; spots black (sparse in *S. salar*). (Spots may be faint if fish has been in salt water for some time.)

Genus *Salmo*—Trouts

71 (72) Teeth on back of tongue; red dash on under side of lower jaw (conspicuous in fresh-water specimens, frequently absent in marine individuals).

Coastal cut-throat trout *Salmo clarkii clarkii*

72 (71) No teeth on back of tongue; no red dash on under side of lower jaw.
73 (74) Black spots on body large, in many cases each surrounded by halo of pink or red.

Brown trout *Salmo trutta*

74 (73) Black spots on body small, without halos.
75 (76) Caudal peduncle stout; rays in anal fin, 10 or 11 usually, 9 or 12 occasionally; continuous red band, varying in width, along side of body, always present in mature fish; usually spots on caudal fin.

Steelhead trout *Salmo gairdnerii gairdnerii*

76 (75) Caudal peduncle slender; rays in anal fin, 9 usually, 8 or 10 occasionally; never continuous red band along side of body; seldom spots on caudal fin.

Atlantic salmon *Salmo salar*

77 (70) Teeth on head of vomer only; spots yellow and red, never black (frequently yellow or red spots may be faint if fish has been in salt water for some time).

Genus *Salvelinus*—Chars

78 (79) Spots on back, pale yellow; no vermiculations on back or dorsal fin.
Dolly Varden *Salvelinus malma*

79 (78) No spots on back; prominent dark green vermiculations on back and dorsal fin.
Speckled char *Salvelinus fontinalis*

80 (59) No fleshy appendage at base of either pelvic fin.
81 (88) Lateral line present.

Family **OSMERIDAE**—Smelts

82 (83) Scales on lateral line, more than 150, small (2 villous bands of scales along each side of body in breeding male); adipose fin large, length of base about half that of dorsal fin; pectoral fin broad, rays, 16 to 20.
Capelin *Mallotus catervarius*

83 (82) Scales on lateral line, fewer than 85, large (no villous band of scales along each side of body in male); adipose fin rather small, length of base much less than half that of dorsal fin; pectoral fin narrow, rays, 15 or fewer.
84 (85) Origin of dorsal fin slightly in front of origin of pelvic fins.
Silver smelt *Hypomesus pretiosus*

85 (84) Origin of dorsal fin above or slightly behind origin of pelvic fins.
86 (87) Striae on opercular bones following contour, well defined; pectoral fins distinctly shorter than length of head; black stippling on back sparse, fine.
Eulachon *Thaleichthys pacificus*

87 (86) No striae on opercular bones; pectoral fin as long as head, or longer; black stippling on back and head dense, prominent.
Long-finned smelt *Spirinchus dilatus*

88 (81) Lateral line absent.

Family **BATHYLAGIDAE**—Black smelts

89 (90) Rays in anal fin, 18 to 20; scales in oblique rows above midline of body, more than 30.
Slender black smelt *Bathylagus pacificus*

90 (89) Rays in anal fin, 23 to 27; scales in oblique rows above midline of body, fewer than 30.
Big-scaled black smelt *Bathylagus milleri*

91 (58) Eyes on cylindrical bases, high, directed upward; snout broad, shovel-like.

Family **MACROPINNIDAE**—Barrel-eyes

Barrel-eye *Macropinna microstoma*

92 (49) Photophores or luminous spots present.
93 (112) Photophores present on body; no luminous spots on eyes.
94 (101) Photophores in 2 more or less parallel rows on each side of abdomen.
95 (98) Teeth on jaws small.
96 (97) Body elongate, slender, little compressed.

Family **GONOSTOMATIDAE**—Angle-mouths

Veiled angle-mouth *Cyclothone microdon*

97 (96) Body short, deep, very greatly compressed.

Family **STERNOPTYCHIIDAE**—Hatchet-fishes

Silvery hatchet-fish *Argyropelecus olfersii*

98 (95) Teeth on jaws large, fang-like.

99 (100) Scales, adipose and pectoral fins, present.

Family **CHAULIODONTIDAE**—Viper-fishes

Fanged viper-fish *Chauliodus macouni*

100 (99) Scales, adipose and pectoral fins, absent.

Family **STOMIATIDAE**—Stomiatids

Arrow-fish *Tactostoma macropus*

101 (94) Photophores not in 2 parallel rows on each side of abdomen.

Family **MYCTOPHIDAE**—Lantern-fishes

102 (103) Anal photophores (AO), in continuous series; posterolateral (Pol), photophore, none.

Big-eyed lantern-fish *Electrona thompsoni*

103 (102) Anal photophores (AO), in 2 series (AO_a - AO_p), separated by an interspace; posterolateral (Pol), photophores, 1 or 2.

104 (105) Lateral line very short, pores on only few anterior scales; suprapectoral (PLO), photophore never above base of pectoral fin; precaudal (Prc), photophore, 1, well separated from posterior anal (AO_p), photophore series.

Blue lantern-fish *Tarletonbeania crenularis*

105 (104) Lateral line extending to base of caudal fin; suprapectoral (PLO), photophore always above and slightly anterior to base of pectoral fin; precaudal (Prc), photophores, 2 or 4 (counted as 4 when in continuous series with posterior anal (AO_p), photophore series).

106 (107) Tip of pectoral fin reaching well behind insertion of pelvic fin; precaudal (Prc), photophores, 2, distinctly separated from posterior anal (AO_p), photophore series; luminous organs on caudal peduncle, either supracaudal (male), or infracaudal (female), never both present on same fish.

Big-finned lantern-fish *Myctophum californiense*

107 (106) Tip of pectoral fin not reaching behind insertion of pelvic fin; precaudal (Prc), photophores, 4, sometimes in continuous series with posterior anal (AO_p), photophores; luminous organs, if present on caudal peduncle, both supra- and infracaudal on same fish.

108 (109) Suprapectoral (PLO), photophore markedly nearer base of pectoral fin than lateral line; suprapectoral luminous organ large, conspicuous; dorsonasal (Dn), photophore very large, prominent; suborbital (So), photophore large, elongate; no luminous organs on caudal peduncle.

White-spotted lantern-fish *Diaphus rafinesquii*

109 (108) Suprapectoral (PLO), photophore equidistant between lateral line and base of pectoral fin or markedly nearer lateral line than base of pectoral fin; no suprapectoral luminous organ; no dorsonasal (Dn), or suborbital (So), photophores developed; both supra- and infracaudal luminous organs present.

110 (111) Eye large, diameter 3.5 to 4.5 in length of head; fourth precaudal (Prc$_4$), photophore distinctly below posterior end of lateral line.

Small-finned lantern-fish *Lampanyctus leucopsarus*

111 (110) Eye small, diameter 5.4 to 6.5 in length of head; fourth precaudal (Prc$_4$), photophore on posterior end of lateral line.

Small-eyed lantern-fish *Lampanyctus regalis*

112 (93) Photophores absent from body; a luminous spot on each eye.

Family **SCOPELARCHIDAE**—Scopelarchids

Pearl-eye *Neoscopelarchoides dentatus*

113 (48) Base of dorsal fin longer than head, rays more than 28.

Family **ALEPIDOSAURIDAE**—Lancet-fishes

Handsaw-fish *Alepidosaurus aesculapius*

114 (43) Dorsal fin followed by 5 to 7 free finlets.

Family **SCOMBERESOCIDAE**—Sauries

Saury *Cololabis saira*

115 (40) PELVIC FINS THORACIC IN POSITION.

116 (117) Large oblong vertical bony plates on sides of body; spine in pelvic fin large, serrated, capable of being locked in position when fully extended.

Family **GASTEROSTEIDAE**—Sticklebacks

Three-spined stickleback *Gasterosteus aculeatus*

117 (116) No large oblong vertical bony plates on sides of body; spine, if present in pelvic fin, not large or serrated, or capable of being locked in position when fully extended.

118 (119) Head prolonged into tubular snout with small jaws at tip.

Family **AULORHYNCHIDAE**—Tube-snouts

Tube-snout *Aulorhynchus flavidus*

119 (118) Head never prolonged into tubular snout with small jaws at tip.

120 (135) Dorsal fins (2), or (3), supported by rays only, barbel usually present on tip of lower jaw.

121 (130) Caudal fin well developed.

122 (123) Dorsal fins (2), second deeply notched.

Family **MERLUCCIIDAE**—Hakes

Hake *Merluccius productus*

123 (122) Dorsal fins (3), or (2), if two, second not deeply notched.

Family **GADIDAE**—Cods

124 (129) Mouth terminal.

125 (126) Lower jaw projecting; eye large; barbel on lower jaw, absent or minute; anus below interspace between first and second dorsal fins.

Whiting *Theragra chalcogramma*

126 (125) Lower jaw included; eye moderate; barbel on lower jaw well developed; anus not below interspace between first and second dorsal fins.

127 (128) Anus below first dorsal fin; barbel small, length equal to half diameter of eye.

Tomcod *Microgadus proximus*

128 (127) Anus below second dorsal fin; barbel well developed, length at least equal to diameter of eye.

Cod *Gadus macrocephalus*

129 (124) Mouth subterminal.

Long-finned cod *Antimora rostrata*

130 (121) Caudal fin absent.

Family **MACRURIDAE**—Grenadiers

131 (132) Interspace between dorsal fins longer than length of base of first dorsal fin; anus below interspace between dorsal fins.

Smooth-scaled grenadier *Dolloa cyclolepis*

132 (131) Interspace between dorsal fins shorter than length of base of first dorsal fin; anus below second dorsal fin.
133 (134) Interspace between dorsal fins more than half length of base of first dorsal fin; teeth on lower jaw in one row, large.

Filamented grenadier *Chalinura filifera*

134 (133) Interspace between dorsal fins less than half length of base of first dorsal fin; teeth on lower jaw in villiform band, none enlarged.

Rough-scaled grenadier *Macrurus acrolepis*

135 (120) Dorsal fins (1), or (2), if two, first composed of spines; barbel absent from lower jaw.
136 (435) Lateral lines, if present, on each side of body, 1 or more, never 4 accompanied by cirri and photophores.
137 (432) Pelvic fins separate, or united forming a hollow cone or a complete circular or oval adhesive disk, never forming together with fold of skin from ventral surface of body a laterally cleft adhesive disk.
138 (431) Body never limp, oblong, much compressed with pectoral and caudal fins symmetrically rounded.
139 (430) If dorsal fins (2), first not modified to form large adhesive disk on top of head and anterior portion of body.
140 (397) Body symmetrical; an eye on each side of head.
141 (142) Pelvic fins each with 14 to 17 long rays; deeply ovate body dark bluish gray in colour with numerous round white or silvery spots.

Family **LAMPRIDAE**—Moon-fishes

Opah *Lampris regius*

142 (141) Pelvic fins with total number of rays, or spines and rays, not more than 8; if body ovate, colour never dark bluish gray with white or silvery spots.
143 (144) Upper lobe of caudal fin very greatly developed, fan-shaped; anal fin absent.

Family **TRACHYPTERIDAE**—Ribbon-fishes

King-of-the-salmon *Trachypterus rex-salmonorum*

144 (143) Upper lobe of caudal fin not greatly developed; not fan-shaped; anal fin present.
145 (148) Dorsal fin III, 12 to 16, short; pelvic fins separate, each I, 7.

Family **MELAMPHAIDAE**—Melamphids

147 (147) Prominent crest on top of head; rostral spine present.

Crested melamphid — *Melamphaes rugosus*

147 (146) No crest on top of head; rostral spine absent.

High-snouted melamphid — *Melamphaes cavernosus*

148 (145) Dorsal fin not as above; pelvic fins, if separate, each with 1 spine and 5 rays or fewer, or if spine absent, 6 rays or fewer.

149 (150) Dorsal and anal fins each single, anterior portion of each elevated; caudal fin very broadly lunate on slender caudal peduncle.

Family **BRAMIDAE**—Pomfrets

Pomfret — *Brama raii*

150 (149) Dorsal and anal fins double or single, if each single, never both with anterior portions prominently elevated; caudal fin not broadly lunate on slender caudal peduncle.

151 (154) Anal fin short with two weak spines, origin about under posterior half of base of rayed dorsal fin; posterior of preopercle minutely crenulate.

Family **SCIAENIDAE**—Croakers

152 (153) Lower jaw projecting; fleshly appendage at base of each pelvic fin.

White sea-bass — *Cynoscion nobilis*

153 (152) Lower jaw included; no fleshly appendage at base of either pelvic fin.

King-fish — *Genyonemus lineatus*

154 (151) If anal fin short, with two weak spines, origin not about under posterior half of base of rayed dorsal fin; posterior of preopercle not crenulate.

155 (168) Sheath of scales at base of dorsal fin demarked from scales of body by pronounced furrow.

Family **EMBIOTOCIDAE**—Sea-perches

156 (159) Scales on lateral line, fewer than 50.

157 (158) Rays in dorsal fin, 18 to 23; rays in anal fin, 23 to 25; no frenum between lower lip and symphysis of lower jaw.

Yellow shiner — *Cymatogaster aggregatus*

158 (157) Rays in dorsal fin, 13 to 15; rays in anal fin, 21 or 22; frenum between lower lip and symphysis of lower jaw.

Brown sea-perch — *Brachyistius brevipinnis*

159 (156) Scales on lateral line, more than 50.

160 (165) Frenum between lower lip and symphysis of lower jaw; none of spines in spinous portion of dorsal fin longer than longest ray.

161 (164) Last spine in spinous portion of dorsal fin shorter than first ray.

162 (163) Last spine in spinous portion of dorsal fin about three-quarters length of ray following; blue longitudinal stripes on sides of body; no dark spot on preopercle behind posterior tip of upper jaw.

Blue sea-perch — *Taeniotoca lateralis*

163 (162) Last spine in spinous portion of dorsal fin about half length of ray following; no blue stripes on sides of body; dark spot on preopercle behind posterior tip of upper jaw, prominent.

Dusky sea-perch — *Damalichthys vacca*

164 (161) Last spine in spinous portion of dorsal fin about equal in length to ray following.
White sea-perch *Phanerodon furcatus*

165 (160) No frenum between lower lip and symphysis of lower jaw; middle spines in spinous portion of dorsal fin longer than longest ray.
166 (167) Rakers below angle of first gill arch, about 21; if bands of colour across body, those above lateral line not alternating with those below.
Wall-eyed sea-perch *Hyperprosopon argenteum*

167 (166) Rakers below angle of first gill arch, 11 to 13; bands of colour across body above lateral line alternating with those below.
Porgy *Holconotus rhodoterus*

168 (155) No sheath of scales along base of dorsal fin.
169 (170) Fringes on lips.
Family **TRICHODONTIDAE**—Sand-fishes
Sand-fish *Trichodon trichodon*

170 (169) No fringes on lips.
171 (174) Dorsal fin (1), composed entirely of rays, first 3 to 20 rays entire, remainder branched; lateral line high, straight from upper margin of opercle to base of caudal fin.
Family **BATHYMASTERIDAE**—Ronquils

172 (173) First 3 or 4 rays in dorsal fin entire, remainder branched; scales ctenoid.
Searcher *Bathymaster signatus*

173 (172) First 20 to 30 rays in dorsal fin entire, remainder branched; scales cycloid.
Ronquil *Ronquilus jordani*

174 (171) Dorsal fin, if single and composed of rays, not with first 3 to 20 rays entire and remainder branched; lateral line, if high, not straight from upper margin of opercle to base of caudal fin.
175 (184) Dorsal and anal fins each followed by 1 or more free finlets.
176 (177) Dorsal and anal fins each followed by single finlet.
Family **CARANGIDAE**—Carangids
Scad *Decapterus polyaspis*

177 (176) Dorsal and anal fins each followed by 5 or more free finlets.
Family **SCOMBRIDAE**—Mackerels

178 (179) Finlets following dorsal fin, 5 or 6; stripes across dorsal surface and part way down sides of body, more than 20, wavy, dark.
Pacific mackerel *Pneumatophorus diego*

179 (178) Finlets following dorsal fin, 8 or 9; stripes, if present, not as above.
180 (183) Pectoral fin shorter than head, not sabre-shaped; stripes along each side of body, either above or below lateral line.
181 (182) Spines in first dorsal fin, XVIII; stripes on upper portion of body, 10 or 11.
Bonito *Sarda lineolata*

182 (181) Spines in first dorsal fin, XV or XVI; stripes on lower portion of body, 4 or 5.
Skipjack *Katsuwonus pelamis*

183 (180) Pectoral fin longer than head, sabre-shaped; no stripes on body.
Albacore *Thunnus alalunga*

184 (175) Dorsal and anal fins not followed by finlets.
185 (190) Pelvic fins united, forming hollow cone but not flattened adhesive disk.

Family **GOBIIDAE**—Gobies

186 (187) Scales large, in oblique rows above midline of body, fewer than 30, usually 25 to 28; black on pelvic fins except at bases.
Large-scaled goby *Rhinogobiops nicholsii*

187 (186) Scales small to moderate, in oblique rows above midline of body, more than 60; not entirely black on pelvic fins.
188 (189) Mouth moderate, maxillary extending to point below pupil of eye; spines in spinous dorsal fin, VII; scales small, in oblique rows above midline of body, about 86; black on tips of all fins.
Fine-scaled goby *Lepidogobius lepidus*

189 (188) Mouth large, maxillary extending to point below posterior margin of eye, or behind; spines in spinous dorsal fin, VI, or fewer; scales moderate, in oblique rows above midline of body, fewer than 75; not black on fins.
Arrow goby *Clevelandia ios*

190 (185) Pelvic fins separate; *or*, if united, not forming a hollow cone but a flattened adhesive disk with thickened margin.
191 (222) Body elongate, eel-like; scales, if present, small.
192 (221) Gill openings extending below bases of pectoral fins; pelvic fins slightly in advance of pectoral fins, not below eyes; scales present.
193 (212) Dorsal fin composed entirely of spines, more than 30 in number, or of spines anteriorly followed by 5 to 8 elevated rays; caudal fin clearly demarked from dorsal and anal fins.
194 (197) Dorsal fin with first 5 spines longer than those following, posterior portion of fin elevated, supported by 5 to 8 rays; lateral line decurved, then straight.

Family **CLINIDAE**—Kelp-fishes

195 (196) Dorsal fin with first 4 or 5 spines evenly spaced, last spine approximately same height as first ray; two conspicuous brownish black ocelli on each side of body.
Spotted kelp-fish *Gibbonsia elegans montereyensis*

196 (195) Dorsal fin with first 3 spines closely approximated, last spine approximately half length of first ray; no ocelli on sides of body.
Striped kelp-fish *Gibbonsia metzi*

197 (194) Dorsal fin not as above, composed entirely of spines; lateral line, if present, not decurved.
198 (205) Gill membranes united, free from isthmus, not extending far forward.

Family **PHOLIDAE**—Gunnels

199 (202) Cirri on top of head conspicuous, numerous, fleshy.
200 (201) Cirri on head low, extending only onto first spine of dorsal fin; rays in anal fin, 37 to 42; ocelli on dorsal fin in male.
Ornamented blenny *Chirolophis nugator*

201 (200) Cirri on head high, plumose, extending onto tips of first 4 to 8 spines of dorsal fin; rays in anal fin, 44 to 61; no ocelli on dorsal fin.
Decorated blenny *Chirolophis polyactocephalus*

202 (199) No cirri on head.
203 (204) Black markings along base of dorsal fin in series, V- to U-shaped.
Saddled blenny *Pholis ornatus*

204 (203) Black markings along base of dorsal fin in series, bracket-shaped, as ( ).
Bracketed blenny *Pholis laetus*

205 (198) Gill membranes joined far forward to isthmus, with or without free fold posteriorly.
Family **LUMPENIDAE**—Eel-blennies

206 (207) Gill membranes joined far forward to isthmus, with free fold posteriorly; Y-shaped marks black, in series on each side of body.
Y-blenny *Allolumpenus hypochromus*

207 (206) Gill membranes joined far forward to isthmus, without free fold posteriorly; no Y-shaped black marks on sides of body.
208 (209) Spine in anal fin, I, or none; streaks on sides of body short, dark.
Eel-blenny *Lumpenus anguillaris*

209 (208) Spines in anal fin, III to V; streaks, if present on sides of body, not short or dark.
210 (211) Snout short; cheek not appearing inflated; white vertical bars on sides of body, short; pale cream on lining of mouth.
White-barred blenny *Poroclinus rothrocki*

211 (210) Snout long; cheek appearing inflated; no white vertical bars on sides of body; very dusky to black on lining of mouth.
Long-snouted blenny *Lumpenella longirostris*

212 (193) Dorsal fin composed entirely of rays; caudal fin not demarked from dorsal and anal fins.
Family **ZOARCIDAE**—Eel-pouts

213 (220) Teeth present on palatines.
214 (219) Teeth present on vomer.
215 (218) Pectoral fins entire; creamy white to pink on peritoneum.
216 (217) Cartilaginous folds on ventral surface of head large, prominent, lobed anteriorly; pelvic fins moderate, length 1.25 to 1.5 in diameter of eye; white vertical bars on sides of body usually present, pale in adult, first 2 in front of dorsal fin.
Wattled eel-pout *Lycodes palearis*

217 (216) Cartilaginous folds on ventral surface of head moderate, without lobes; pelvic fins minute, length about 3 in diameter of eye; if vertical white bars present on sides of body, first one only in front of dorsal fin.
Short-finned eel-pout *Lycodes brevipes*

218 (215) Pectoral fins deeply notched; black on peritoneum.
Black-finned eel-pout *Furcimanus diapterus*

219 (214) No teeth on vomer.
Big-finned eel-pout *Aprodon corteziana*

220 (213) No teeth on palatines.
Black-bellied eel-pout *Lycodopsis pacificus*

221 (192) Gill openings reduced to small vertical slits in front of pectoral fins; pelvic fins far forward below eyes; scales absent.

Family **DEREPODICHTHYIDAE**—Cusk-pouts

Cusk-pout *Derepodichthys alepidotus*

222 (191) Body not elongate and eel-like; scales, if present, small to large.
223 (224) Rays in pelvic fins, 2, elongate, filamentous; lateral line on each side of body in two parts, anterior portion high ending at point above midlateral position, posterior portion nearly straight along midlateral position commencing below posterior end of anterior portion.

Family **BROTULIDAE**—Brotulids

Red brotulid *Brosmophycis marginatus*

224 (223) If rays only in pelvic fins, not as above; lateral line, or lines, not divided as above.
225 (226) Top of head spongy; fifth ray of pelvic fin long, filamentous.

Family **CENTROLOPHIDAE**—Rudder-fishes

Brown rudder-fish *Icichthys lockingtoni*

226 (225) Top of head, if soft, not spongy; fifth ray of pelvic fin, if present, not long or filamentous.
227 (228) Body subterete; head very elongate, sharply pointed, with large teeth.

Family **SPHYRAENIDAE**—Barracudas

Barracuda *Sphyraena argentea*

228 (227) Body not subterete; head, if elongate, not sharply pointed, not with large teeth.
229 (374) Pelvic fins separate, not forming flattened adhesive disk.
230 (353) Body not completely enclosed in bony plates.
231 (288) Body below lateral line completely covered with unmodified cycloid or ctenoid scales.
232 (273) Spines in anal fin, III, conspicuously large, stout, second and third usually much longer and stronger than first; rays, 5 to 9.

Family **SCORPAENIDAE**—Rock-fishes

233 (272) Dorsal fin, XIII or XIV, 12 to 16; anal fin, III, 6 to 9; no lobe on pectoral fin; no sharply spinous ridge below eye.
234 (245) Interorbital space highly convex; cranial spines, when present, small.
235 (236) Dorsal fin deeply notched, membranes between spinous and rayed portions so low that fin almost separated into two fins; rays in pectoral fin, 15; nasal spines, absent.
Bocaccio *Sebastodes paucispinis*

236 (235) Dorsal fin not deeply notched; rays in pectoral fin, 17 or more; nasal spines present.
237 (242) Parietal spines not developed.

238 (239) Depth of body 2.9 to 3.5 in standard length; membranes of spinous portion of dorsal fin deeply incised; dusky yellow on caudal fin.
Yellow-tailed rock-fish *Sebastodes flavidus*

239 (238) Depth of body 2.5 to 2.9 in standard length; membranes of spinous portion of dorsal fin moderately to slightly incised; no yellow on caudal fin.
240 (241) Diameter of eye, 4 to 4.5 in length of head; prefrontal spine, absent; white on peritoneum.
Black rock-fish *Sebastodes melanops*

241 (240) Diameter of eye, 4.5 to 5 in length of head; prefrontal spine, present; black on peritoneum.
Priest-fish *Sebastodes mystinus*

242 (237) Parietal spines developed.
243 (244) Spine on each lobe of lacrymal bone; scales on mandible smooth; colour chiefly orange; black blotch on spinous portion of dorsal fin, from seventh to tenth spines, large; pale red with dusky mottling on lining of mouth; black on peritoneum.
Orange rock-fish *Sebastodes pinniger*

244 (243) No spines on lobes of lacrymal bone; scales on mandible rough; colour chiefly vermilion; no black blotch on spinous portion of dorsal fin, membranes may be somewhat black on posterior margins; red on lining of mouth; white to dusky on peritoneum.
Vermilion rock-fish *Sebastodes miniatus*

245 (234) Interorbital space not highly convex, usually flat or concave; cranial spines usually developed.
246 (257) Interorbital space slightly convex to flat, never concave; cranial spines usually slender, sharp.
247 (252) Pores on lateral line, 41 or more.
248 (249) Pores on lateral line, fewer than 45.
Wilson's rock-fish *Sebastodes wilsoni*

249 (248) Pores on lateral line, 47 or more.
250 (251) Lower jaw little projecting; frontal spines II and III only, present.
Red-striped rock-fish *Sebastodes proriger*

251 (250) Lower jaw much projecting; frontal spines I, II, III, present.
Long-jawed rock-fish *Sebastodes alutus*

252 (247) Pores on lateral line, 39 or fewer.
253 (254) Spines on lacrymal lobes minute, sometimes absent; dentigerous lobes on upper jaw little developed.
Olive-backed rock-fish *Sebastodes saxicola*

254 (253) Spines on lacrymal lobes well developed; dentigerous lobes on upper jaw well developed.
255 (256) Spines on lacrymal bone, 2, 1 on anterior lobe, 1 on posterior lobe; upper 2 preopercular spines not closely approximated; no black on isthmus.
Lobe-jawed rock-fish *Sebastodes diploproa*

256 (255) Spines on lacrymal bone, 4 to 6, 1 on anterior lobe, 3 to 5 on posterior lobe; upper 2 preopercular spines closely approximated; large black area on isthmus.

Black-throated rock-fish *Sebastodes introniger*

257 (246) Interorbital space concave (sometimes flat in *S. dallii*), usually narrow; cranial spines strongly developed.

258 (271) Median frontal ridges and spines absent or very weakly developed; colour not gray to pale rose with 5 carmine vertical bars, or bright orange red with 5 jet black vertical bars, on each side of body.

259 (260) Preopercular spines broad, third multifid; frontal spines, I, II, III, present on head; colour nearly uniform deep vermilion.

Red snapper *Sebastodes ruberrimus*

260 (259) If preopercular spines broad, third not multifid; frontal spines, II and III only, present on head; if red colour present, not uniform deep vermilion.

261 (264) Body slender, depth 3.1 or more in standard length; dusky to black on peritoneum.

262 (263) Eye small, diameter about 4 in length of head; stripes on body olive green, irregular, longitudinal, interrupted; dusky on peritoneum.

Green-striped rock-fish *Sebastodes elongatus*

263 (262) Eye large, diameter about 3 in length of head; brown blotches on body, 5; jet black on peritoneum.

Big-eyed rock-fish *Sebastodes zacentrus*

264 (261) Body deep, depth 3 or less in standard length; pale to white on peritoneum.

265 (268) Spine present on posterior lobe of lacrymal bone; no yellow wedge or stripe from spinous dorsal fin to lateral line.

266 (267) Pores on lateral line, about 49; scales in oblique rows above lateral line, 61 or 62; rakers on first gill arch, 25 or fewer; somewhat dusky on pelvic fins.

Brown rock-fish *Sebastodes dallii*

267 (266) Pores on lateral line, 44 or fewer; scales in oblique rows above lateral line, 40 to 48; rakers on first gill arch, 27 or more; coppery black on pelvic fins.

Copper rock-fish *Sebastodes caurinus*

268 (265) No spine on posterior lobe of lacrymal bone; yellow wedge or stripe from spinous dorsal fin to lateral line.

269 (270) Membranes of dorsal fin between first and fifth spines incised to more than half length of spines; longest spine about 1.8 in length of head; colour yellow to brown; small round spots of clear orange brown closely covering anterior portion of body.

Orange-spotted rock-fish *Sebastodes maliger*

270 (269) Membranes of dorsal fin between first and fifth spines not incised to half length of spines; longest spine about 2 in length of head; colour blue black; small white or yellow speckling everywhere on body.

Yellow-striped rock-fish *Sebastodes nebulosus*

271 (258) Median frontal ridges and spines well developed, high; colour gray to pale rose with 5 carmine vertical bars, or orange red with 5 jet black vertical bars, on each side of body.

Banded rock-fish *Sebastodes nigrocinctus*

272 (233) Dorsal fin, XV to XVII, 9 or 10; anal fin, III, 5; lower 7 to 9 rays in pectoral fin thickened, extended to form distinct lobe; ridge below eye long, knife-like, sharply spinous.

Spiny-cheeked rock-fish *Sebastolobus alascanus*

273 (232) Spines in anal fin, 0 to IV; if three, not large or stout, sometimes buried in flesh; rays more than 10.

274 (285) Gill membranes entirely free from isthmus; multifid cirrus above each eye.

Family **HEXAGRAMMIDAE**—Greenlings

275 (280) Lateral lines on each side of body, more than 1.

276 (277) Multifid cirrus above each eye prominent, another on each side of occiput, very small (latter may be located in slight depression almost midway on straight line from middle of front of eye to origin of dorsal fin); spine closely applied to first ray in anal fin, short, stout.

Kelp greenling *Chiropsis decagrammus*

277 (276) Multifid cirrus above each eye present, none on occiput; no spine before anal fin.

278 (279) Cirrus above each eye small, length less than 2 in diameter of eye; caudal peduncle slender, depth 3 or more in length of head; first lateral line short, not extending beyond middle of spinous portion of dorsal fin; fourth lateral line short, not extending beyond middle of pelvic fin; caudal fin slightly emarginate.

White-spotted greenling *Hexagrammos stelleri*

279 (278) Cirrus above each eye large, slender, densely fringed, length equal to, or greater than, diameter of eye; caudal penducle stout, depth about 2 in length of head; first lateral line long, extending beyond middle of rayed portion of dorsal fin; fourth lateral line long, extending to about middle of anal fin; caudal fin rounded.

Fringed greenling *Lebius superciliosus*

280 (275) Lateral line on each side of body, 1.

281 (282) Maxillary not reaching anterior margin of eye; distinct dark bars on each side of body and caudal fin, 7, vertical.

Painted greenling *Oxylebius pictus*

282 (281) Maxillary reaching to point well behind anterior margin of eye; no distinct dark bars on sides of body.

283 (284) Anterior spines of spinous portion of dorsal fin elongate, second spine very elongate; teeth on jaws small.

Long-spined greenling *Zaniolepis latipinnis*

284 (283) Anterior spines of spinous portion of dorsal fin not elongate; teeth on jaws large, canine-like.

Lingcod *Ophiodon elongatus*

285 (274) Gill membranes either narrowly or completely joined to isthmus; no cirrus above either eye.

Family **ANOPLOPOMIDAE**—Skil-fishes

286 (287) Dorsal fins, XVII to XXII - I, 16 to 19, interspace between fins above twice diameter

of eye; anal fin III, 15 to 19, origin below that of rayed dorsal fin; scales in oblique rows above lateral line, about 190.

Sable-fish *Anoplopoma fimbria*

287 (286) Dorsal fins, XII to XIV - I or II, 15 to 17, interspace between fins about equal to diameter of eye (in some individuals, fins may be touching); anal fin, III, 11 to 14, origin posterior to that of rayed dorsal fin; scales in oblique rows above lateral line, 122 to 134.

Giant skil-fish *Erilepis zonifer*

288 (231) Body below lateral line never completely covered with unmodified cycloid or ctenoid scales.

289 (352) Length of head much less than half standard length.

290 (349) Preopercular spines present; spinous portion of dorsal fin not low, its spines not concealed in loose skin; rayed portion anteriorly readily distinguishable from spinous portion.

Family **COTTIDAE**—Sculpins

291 (296) Dorsal fin (1), notched between spinous and rayed portions.

292 (293) Gill membranes free from isthmus; scales absent.

Giant marbled sculpin *Scorpaenichthys marmoratus*

293 (292) Gill membranes joined to isthmus; scales on body above and below lateral line in bands, band above lateral line continuous around anterior of dorsal fin.

294 (295) Band of scales above lateral line in 6 or 7 rows at widest part; gill membranes broadly joined to isthmus.

Brown Irish lord *Hemilepidotus spinosus*

295 (294) Band of scales above lateral line in about 4 rows at widest part; gill membranes narrowly joined to isthmus.

Red Irish lord *Hemilepidotus hemilepidotus*

296 (291) Dorsal fins (2), first spinous, second rayed.

297 (300) Cirri large, on snout, 3, one median, two lateral; on lower jaw, 6, three on each side.

298 (299) Spinous dorsal fin emarginate, first 3 or 4 spines elevated; large silvery white areas on body naked.

Silver spot *Blepsias cirrhosus*

299 (298) Spinous dorsal fin entire, first spines not elevated; body completely covered with minute spines embedded in thick conical fleshly papillae.

Crested sculpin *Histiocottus bilobus*

300 (297) Cirri, if present on head, not as above.

301 (306) Scales between dorsal fins and lateral line in band of 7 to 10 sharply defined rows.

302 (305) Band of scales on each side of body meeting behind rayed dorsal fin.

303 (304) Supraocular cirri present; uppermost preopercular spine broad or weakly bifid.

White-spotted sculpin *Artedius harringtoni*

304 (303) Supraocular cirri absent; uppermost preopercular spine antler-like, spinules, 3.

Padded sculpin *Artedius fenestralis*

305 (302) Band of scales on each side of body not reaching posterior end of rayed dorsal fin.
Round-nosed sculpin *Artedius lateralis*

306 (301) Scales, if present between dorsal fins and lateral line, not in band of 7 to 10 rows.
307 (316) Preopercular spines, 3 or 4, uppermost large, antler-like, with 3 to 6 upwardly directed spinules.
308 (315) Scales present on body above lateral line, either completely covering area or in band two scales in width.
309 (310) Scales between dorsal fins and lateral line completely covering body.
Rough-backed sculpin *Chitonotus pugetensis*

310 (309) Scales between dorsal fins and lateral line in band two scales in width.
311 (312) Rows of scales below bases of dorsal fins extending behind rayed dorsal fin; neither first nor second spine in spinous dorsal fin elongate.
Northern sculpin *Icelinus borealis*

312 (311) Neither row of scales below bases of dorsal fins extending to posterior end of rayed dorsal fin; first 1 or 2 spines of spinous dorsal fin elongate.
313 (314) First 1 or 2 spines in spinous dorsal fin elongate, not reaching rayed dorsal fin when depressed; rows of scales below dorsal fins short, 9 to 14 in each row.
Lesser filamented sculpin *Icelinus tenuis*

314 (313) First 2 spines in spinous dorsal fin very much elongate, reaching to middle of rayed dorsal fin when depressed; rows of scales below dorsal fins long, 28 to 31 in each row.
Filamented sculpin *Icelinus filamentous*

315 (308) Scales absent from body.
Cabezon *Leptocottus armatus*

316 (307) Preopercular spines, 4, 3, 2, or 1, simple or weakly bifid.
317 (318) Uppermost preopercular spine elongate, length 2 or 3 times diameter of eye; large tuberculated plates on lateral line, 29 to 33.
Buffalo sculpin *Enophrys bison*

318 (317) None of preopercular spines elongate as above; no large tuberculated plates on lateral line.
319 (346) Scales or pores on lateral line more than 30.
320 (321) Head broad, depressed; scales on body widely scattered, embedded, each usually with minute projecting spine.
Great sculpin *Myoxocephalus polyacanthocephalus*

321 (320) Head if broad, not greatly depressed; scales on body, if present, not scattered or embedded with minute projecting spine.
322 (327) Skin below lateral line in many oblique folds; posterior margins of folds sharply spinous with modified ctenoid scales.
323 (324) Supraocular cirri, 2, large; spinous dorsal fin long, spines more than 16.
Long-finned sculpin *Jordania zonope*

324 (323) Supraocular cirri, absent; spinous dorsal fin short, spines fewer than 13.

325 (326) Scales between dorsal fins and lateral line very small, of uniform size; lower rays in pectoral fin greatly exserted.

Rough-spined sculpin *Prionistius macellus*

326 (325) Scales between dorsal fins and lateral line of various sizes, in row below bases of dorsal fins enlarged, upright, sharply spinous; rays in pectoral fin not exserted.

Ribbed sculpin *Triglops beani*

327 (322) Skin below lateral line not in oblique folds.
328 (333) Ctenoid scales in single row contiguous with lateral line; or in 4 rows, lowermost contiguous with lateral line; or in single row near bases of dorsal fins.
329 (332) Pectoral fins separate.
330 (331) Dorsal surface of body flattened, forming prominent sharply angular ridge with lateral surface at lateral line; row of scales above and contiguous with lateral line extending forward to midpoint of posterior area of interorbital space, clearly evident; occipital area naked.

Darter sculpin *Radulinus asprellus*

331 (330) Dorsal surface of body arched, not forming prominent ridge with lateral surface at lateral line; row of scales above and contiguous with lateral line, if extending forward onto head, not clearly defined; occipital area scaly.

Taylor's sculpin *Asemichthys taylori*

332 (329) Pectoral fins united anteriorly and ventrally.

Manacled sculpin *Synchirus gilli*

333 (328) Ctenoid scales, if present, of reduced type, not in rows.
334 (335) Spinous dorsal fin very high; gill membranes broadly joined to isthmus; caudal fin asymmetrical, lower rays longest.

Sailor-fish *Nautichthys oculo-fasciatus*

335 (334) Spinous dorsal fin little, if any, elevated; gill membranes free from isthmus; caudal fin symmetrically rounded.
336 (341) Origin of anal fin below spinous dorsal fin.
337 (338) Body everywhere covered with slender spines.

Prickly sculpin *Oligocottus rimensis*

338 (337) Body naked; no tubercles or spines present.
339 (340) Cirri on body single or paired, those on lateral line confined to anterior portion.

Tide-pool sculpin *Oligocottus maculosus*

340 (339) Cirri on body in bunches of 3 or 4, on lateral line and in 2 rows above.

Fluffy sculpin *Oligocottus snyderi*

341 (336) Origin of anal fin below rayed dorsal fin.
342 (343) Head blunt, anterior profile broadly rounded.

Globe-headed sculpin *Clinocottus globiceps*

343 (342) Head acute, anterior profile pointed.
344 (345) Cirri on head multifid, large.

Mossy sculpin *Clinocottus embryum*

345 (344) Cirri on head simple, small.
Sharp-nosed sculpin *Clinocottus acuticeps*

346 (319) Pores on lateral line, 14 or 15; skin soft and thick at bases of dorsal and anal fins.
347 (348) Gill membranes free from isthmus; cranial spines large, upright.
Spiny-headed sculpin *Dasycottus setiger*

348 (347) Gill membranes broadly joined to isthmus; cranial spines absent.
Black-finned sculpin *Malacocottus kincaidi*

349 (290) Preopercular spines absent; spinous portion of dorsal fin very low, its slender spines not evident, concealed in loose skin; rayed portion anteriorly indistinguishable from spinous portion.

Family **PSYCHROLUTIDAE**—Mud-sculpins

350 (351) Rays in pectoral fin, 20 to 23; jaws equal; anus midway between insertion of pelvic fins and origin of anal fin.
Tadpole sculpin *Psychrolutes paradoxus*

351 (350) Rays in pectoral fin, 16 or 17; lower jaw projecting; anus immediately in front of anal fin.
Soft sculpin *Gilbertidia sigalutes*

352 (289) Length of head about half standard length.

Family **RHAMPHOCOTTIDAE**—Big-headed sculpins

Grunt-fish *Rhamphocottus richardsoni*

353 (230) Body completely enclosed in close-fitting bony plates.

Family **AGONIDAE**—Sea-poachers

354 (373) Dorsal fins (2).
355 (358) Gill membranes free from isthmus.
356 (357) Spines on top of head, 4, prominent; body short, deep; lower jaw slightly projecting.
Four-horned sea-poacher *Hypsagonus quadricornis*

357 (356) No spines on top of head; body elongate, slender; lower jaw prominently projecting.
Warty sea-poacher *Occa verrucosa*

358 (355) Gill membranes joined to isthmus, sometimes with short free fold posteriorly.
359 (362) Spines on snout pointing forward, 2, either free or covered with skin; no rostral plate.
360 (361) Mouth ventral, with cluster of large cirri at each angle; spines pointing forward on snout naked, sharp; caudal fin entirely dusky.
Sturgeon-like sea-poacher *Agonus acipenserinus*

361 (360) Mouth subterminal, without cluster of cirri at each angle; spines pointing forward on snout covered with skin; caudal fin black with semi-transparent light spot not reaching margin.
Window-tailed sea-poacher *Averruncus emmelane*

362 (359) Spines on snout pointing forward, none; rostral plate with or without upturned spine or spinules.

363 (364) Snout broad, flat; lower jaw projecting; intensely blue black on all fins.
Black-finned sea-poacher *Bathyagonus nigripinnis*

364 (363) Snout not as above; jaws about equal; not blue black on fins.
365 (370) Rostral plate terminal, with single upright spine or none.
366 (369) Definite pit on top of head.
367 (368) Body slender, plates spinous; rostral plate with upright spine; occipital pit not nearly half depth of head.
Pigmy sea-poacher *Odontopyxis trispinosus*

368 (367) Body stout anteriorly; plates smooth; rostral plate without spine; occipital pit nearly half depth of head.
Deep-pitted sea-poacher *Bothragonus swanii*

369 (366) No pit on top of head.
Black-tipped sea-poacher *Xenopyxis latifrons*

370 (365) Rostral plate terminal, spines forming star with 5 or more points.
371 (372) Origin of anal fin below interspace between dorsal fins; spines absent from lower margin of lacrymal bone.
Gray star-snout *Asterotheca alascana*

372 (371) Origin of anal fin below interspace between dorsal fins; spines well developed on lower margin of lacrymal bone.
Spiny-cheeked star-snout *Asterotheca infraspinata*

373 (354) Dorsal fin (1), (rayed fin only).
Smooth sea-poacher *Anoplagonus inermis*

374 (229) Pelvic fins united, forming flattened adhesive disk with thickened margin.
375 (376) Body short, covered with spinous conical tubercles.

Family **CYCLOPTERIDAE**—Lump-suckers

Spiny lump-sucker *Eumicrotremus orbis*

376 (375) Body elongate, not covered with spinous conical tubercles.

Family **LIPARIDAE**—Liparids

377 (390) Posterior margin of adhesive disk below or behind vertical from gill openings.
378 (389) Dorsal fin connected to caudal fin for one-fifth or less length of caudal fin.
379 (382) Gill opening entirely above pectoral fin, or not extending below first ray.
380 (381) Adhesive disk large, length less than 2 in length of head; white band across base of caudal fin.
Ring-tailed liparid *Liparis rutteri*

381 (380) Adhesive disk moderate, length more than 2 in length of head; no white band across base of caudal fin.
Pallas's liparid *Liparis callyodon*

382 (379) Gill opening extending below upper 3 or more rays of pectoral fin.
383 (386) Rays in pectoral fin, fewer than 35.

384 (385) Greatest depth of body slightly behind origin of anal fin; adhesive disk oval.
Shore liparid *Liparis florae*

385 (384) Greatest depth of body slightly behind posterior margin of disk; adhesive disk circular.
Günther's liparid *Liparis cyclopus*

386 (383) Rays in pectoral fin, more than 35.
387 (388) Anal fin extending onto caudal fin for less than one-fifth length of caudal fin; rays in pectoral fin more numerous than in dorsal fin; lower lobe of pectoral fin usually extending to point behind anus.
Juan de Fuca liparid *Liparis fucensis*

388 (387) Anal fin extending onto caudal fin for one-fifth or more length of caudal fin; rays in pectoral fin equal to or fewer in number than in dorsal fin; lower lobe of pectoral fin usually not extending to anus.
Denny's liparid *Liparis dennyi*

389 (378) Dorsal fin connected to caudal fin for more than four-fifths length of caudal fin.
Continuous-finned liparid *Liparis pulchellus*

390 (377) Posterior margin of adhesive disk in front of vertical from gill openings.
391 (392) Nostrils double; anal fin barely reaching caudal fin.
Green's liparid *Polypera greeni*

392 (391) Nostril single; anal fin extending onto caudal fin for at least two-fifths length of caudal fin.
393 (394) Adhesive disk large, length less than 3 in length of head, larger than diameter of eye; eye small, diameter more than 6 in length of head; dorsal and anal fins high anteriorly.
Abyssal liparid *Careproctus ovigerum*

394 (393) Adhesive disk small, length more than 6 in length of head, smaller than diameter of eye; eye moderately large, diameter less than 5 in length of head; dorsal and anal fins low anteriorly.
395 (396) Gill opening extending down to about upper 14 rays of pectoral fin; length of adhesive disk 7.3 to 9 in length of head; pale to dusky on caudal fin.
Small-disked liparid *Careproctus gilberti*

396 (395) Gill opening not extending down to pectoral fin; length of adhesive disk 6.4 to 6.9 in length of head; black on caudal fin.
Black-tailed liparid *Careproctus melanurus*

397 (140) Body asymmetrical; both eyes on same side of head.
398 (401) Pelvic fins asymmetrically placed, that of eyed side of body on ridge of abdomen, that of blind side not on ridge; eyes and colour on left side of body.

Family **BOTHIDAE**—Sand dabs

399 (400) Diameter of lower eye longer than length of snout; ridge above lower eye high, bony; interorbital space concave; scales on lateral line, 61 or more.
Mottled sand dab *Citharichthys sordidus*

400 (399) Diameter of lower eye equal to length of snout; no ridge above lower eye; interorbital space flat or convex; scales on lateral line, 58 or fewer.

Speckled sand dab *Citharichthys stigmaeus*

401 (398) Pelvic fins symmetrically placed, one on each side of abdominal ridge; eyes and colour usually on right side. (Except in *Platichthys stellatus*, which may have eyes and colour on either right or left side.)

Family **PLEURONECTIDAE**—Flounders

402 (413) Mouth nearly symmetrical, gape usually, but not always, wide; teeth nearly equally developed on both sides of both jaws.
403 (406) Caudal fin lunate; no spine preceding anal fin.
404 (405) Maxillary extending to point well behind eye; teeth arrow-shaped; scales large, rough; no distinct arch in lateral line over pectoral fin.

Long-jaw flounder *Atheresthes stomias*

405 (404) Maxillary extending to point below eye; teeth not arrow-shaped; scales small, smooth; distinct arch in lateral line over pectoral fin.

Halibut *Hippoglossus stenolepis*

406 (403) Caudal fin truncate or rounded; exposed spine preceding anal fin.
407 (408) Dorsal branch to lateral line close to base of dorsal fin, short; first rays in dorsal fin elongate, mostly free from membranes.

Sand sole *Psettichthys melanostictus*

408 (407) No dorsal branch to lateral line; first rays in dorsal fin not elongate, not free from membranes.
409 (410) Scales on both sides of body large, readily deciduous; on lateral line, 65 to 73; in diagonal row between dorsal fin and lateral line at widest part of body, fewer than 25.

Slender sole *Lyopsetta exilis*

410 (409) Scales on blind side of body small, not deciduous; on lateral line, more than 80; in diagonal row between dorsal fin and lateral line at widest part of body, more than 25.
411 (412) Teeth on upper jaw in 1 row; scales in diagonal row between dorsal fin and lateral line at widest part of body, about 45.

Flat-head sole *Hippoglossoides elassodon*

412 (411) Teeth on upper jaw in 2 rows; scales in diagonal row between dorsal fin and lateral line at widest part of body, about 30.

Brill *Eopsetta jordani*

413 (402) Mouth asymmetrical, gape usually narrow; teeth chiefly on blind sides of jaws.
414 (423) Dorsal branch to lateral line, near base of dorsal fin.
415 (416) Prominent arch in lateral line above pectoral fin.

Rock sole *Lepidopsetta bilineata*

416 (415) No prominent arch in lateral line above pectoral fin, slight bend sometimes present.
417 (420) Scales embedded.
418 (419) Origin of dorsal fin on blind side of body at angle of mouth, first 9 to 12 rays on blind side.

Curl-fin sole *Pleuronichthys decurrens*

419 (418) Origin of dorsal fin on blind side of body opposite anterior margin of upper eye; first 5 or 6 rays only on blind side.
C-O sole *Pleuronichthys coenosus*

420 (417) Scales imbricated, free.
421 (422) Scales on eyed side of body smooth; no scales on fins.
Lemon sole *Parophrys vetulus*

422 (421) Scales on eyed side of body roughened; rough scales on fins.
Butter sole *Isopsetta isolepis*

423 (414) No dorsal branch to lateral line.
424 (425) Prominent arch in lateral line above pectoral fin.
Yellow-fin sole *Limanda aspera*

425 (424) No arch in lateral line above pectoral fin.
426 (427) Body covered with rough scattered stellate plates; alternating bands of black and white or orange yellow on dorsal and anal fins.
Starry flounder *Platichthys stellatus*

427 (426) Body covered with smooth scales without stellate plates; no bands on dorsal or anal fins.
428 (429) Gill opening extending above base of uppermost pectoral fin ray; pectoral fin on eyed side of body very elongate, longer than that of blind side.
Rex sole *Glyptocephalus zachirus*

429 (428) Gill opening not extending above base of uppermost pectoral fin ray; pectoral fin on eyed side of body not elongate, length about equal to that on blind side.
Dover sole *Microstomus pacificus*

430 (139) Dorsal fins (2), first modified to form large adhesive disk on top of head.
Family **ECHENEIDAE**—Remoras
Whale-sucker *Remilegia australis*

431 (138) Body limp, oblong, much compressed; pectoral and caudal fins symmetrically rounded.
Family **ICOSTEIDAE**—Rag-fishes
Fan-tailed rag-fish *Icosteus aenigmaticus*

432 (137) Pelvic fins united forming together with fold of skin from ventral surface of body a laterally cleft adhesive disk.
Family **GOBIESOCIDAE**—Cling-fishes

433 (434) Body stout, tadpole-shaped; head large, broad; rays in dorsal fin, 13 or 14.
Common cling-fish *Sicyogaster maeandricus*

434 (433) Body elongate, slender; head small, narrow; rays in dorsal fin, 4 to 6.
Slender cling-fish *Rimicola eigenmanni*

435 (136) Lateral lines on each side of body, 4, accompanied by cirri and photophores.
Family **BATRACHOIDIDAE**—Toad-fishes
Midshipman *Porichthys notatus*

436 (39) PELVIC FINS ABSENT.
437 (488) Gill openings in front of pectoral fins; body not globular; no jointed appendage on snout.
438 (485) Body slender to deep; if much compressed, scales present.
439 (442) Jaws greatly prolonged, very slender, with recurved tips.

Family **NEMICHTHYIDAE**—Thread-fishes

440 (441) Anus remote from head, distance behind more than 9 times length of pectoral fin; pores on lateral line, in single row.

Snipe eel *Avocetta gilli*

441 (440) Anus near head, below pectoral fins; pores along lateral line, in 3 rows.

Thread-fish *Nemichthys avocetta*

442 (439) Jaws not prolonged, slender or tapering to points with recurved tips.
443 (444) Body completely enclosed in small bony plates; head prolonged into tubular snout with small toothless jaws at end; anal fin, minute or absent.

Family **SYNGNATHIDAE**—Pipe-fishes

Pipe-fish *Syngnathus griseo-lineatus*

444 (443) Body not enclosed in bony plates; head not prolonged into tubular snout; anal fin large, rays 13 or more.
445 (446) Skin on body in many oblique folds passing downward and backward.

Family **AMMODYTIDAE**—Sand-lances

Sand-lance *Ammodytes tobianus personatus*

446 (445) Skin on body not in oblique folds.
447 (448) Body greatly elongate, ending in deeply furcate caudal fin on very slender caudal peduncle.

Family **TRICHIURIDAE**—Hair-tails

Frost-fish *Benthodesmus atlanticus*

448 (447) Body, if elongate, not ending in deeply furcate caudal fin on very slender caudal peduncle.
449 (482) Gill opening on each side of body extending well below base of pectoral fin.
450 (481) Total number of spines (if present), and rays in anal fin, 24 or more.
451 (480) Spines, if present in dorsal fin, more than 50; pectoral fin never long or falcate.
452 (479) Body elongate, slender; rays in anal fin, 32 or more.
453 (472) Dorsal fin composed entirely of hard spines, or of about 90 small hooked spines followed by over 130 unsegmented, unbranched, rays.
454 (471) Dorsal fin composed entirely of hard spines.
455 (456) Teeth large, developed as crushing molars.

Family **ANARRHICHADIDAE**—Wolf-fishes

Wolf-eel *Anarrhichthys ocellatus*

456 (455) Teeth moderate, not developed as crushing molars.
457 (466) Gill membranes free from isthmus.
458 (463) Lateral lines, 4.

Family **XIPHISTERIDAE**—Belted blennies

459 (460) Spines in anal fin, II or III.

Belted blenny *Phytichthys chirus*

460 (459) No spines in anal fin.
461 (462) Distance from tip of snout to occiput greater than distance from occiput to origin of dorsal fin; dorsal fin, LXXI to LXXVII; bands radiating from eye pale, margined with black; no white bar across base of caudal fin.
Rock blenny *Xiphister mucosus*

462 (461) Distance from tip of snout to occiput less than distance from occiput to origin of dorsal fin; dorsal fin, LXV to LXVIII; bands radiating from eye black or dark, abruptly margined with white or pale olive; white bar across base of caudal fin.
Black blenny *Epigeichthys atro-purpureus*

463 (458) Lateral line, absent.
Family **PHOLIDAE**—Gunnels

464 (465) Spines in anal fin, II, small, anterior spine short, rounded. (If one spine only, never grooved like pen-point.)
Fucus blenny *Xererpes fucorum*

465 (464) Spine in anal fin, I, large, grooved anteriorly like pen-point.
Pen-point blenny *Apodichthys flavidus*

466 (457) Gill membranes joined to isthmus.
Family **STICHAEIDAE**—Northern blennies

467 (468) Lower jaw included; fleshy crest on top of head, conspicuous.
Crested blenny *Anoplarchus purpurescens*

468 (467) Lower jaw projecting; no crest on top of head.
469 (470) Maxillary extending at least one diameter of eye behind eye; scales on posterior portion of body.
Wry-mouth *Delolepis giganteus*

470 (469) Maxillary not extending behind eye; no scales on body.
Red devil *Lyconectes aleutensis*

471 (454) Dorsal fin composed of about 90 small hooked spines anteriorly, followed by over 130 unsegmented, unbranched rays.
Family **PTILICHTHYIDAE**—Quill-fishes
Quill-fish *Ptilichthys goodei*

472 (453) Dorsal fin composed entirely of soft rays.
473 (478) Body deeper in front of anus than behind.
Family **ZOARCIDAE**—Eel-pouts

474 (475) Upper jaw projecting; lateral line in two parts, upper anterior high, lower posterior in midlateral position.
Soft eel-pout *Bothrocara mollis*

475 (474) Upper jaw not projecting; lateral line, absent.
476 (477) Lower jaw projecting; snout angular; upper outline of head concave in lateral view.
Pearly eel-pout *Lycodapus fierasfer*

477 (476) Jaws equal; snout rounded; upper outline of head straight in lateral view.
Pale eel-pout *Lycodapus mandibularis*

478 (473) Body deeper behind anus than in front.
Family **SCYTALINIDAE**—Burrowing blennies
Burrowing blenny *Scytalina cerdale*

479 (452) Body moderately elongate, stout; rays in anal fin, 30 or fewer.
Family **ZAPRORIDAE**—Prow-fishes
Prow-fish *Zaprora silenus*

480 (451) Spines in dorsal fin, 3; pectoral fin long, falcate.
Family **STROMATEIDAE**—Butter-fishes
California pompano *Peprilus simillimus*

481 (450) Rays in anal fin, fewer than 18.
Family **COTTIDAE**—Sculpins
Rosy-lipped sculpin *Ascelichthys rhodorus*

482 (449) Gill opening on each side of body not extending below upper 15 or 16 rays of pectoral fin.
Family **LIPARIDAE**—Liparids

483 (484) Gill opening extending down to about upper 10 to 14 rays of pectoral fin; anus below vertical from gill openings, opening downward.
Prickly liparid *Paraliparis deani*

484 (483) Gill opening small, entirely restricted to front of pectoral fin; anus below vertical from eyes, opening forward.
Tadpole liparid *Nectoliparis pelagicus*

485 (438) Body deep, greatly compressed; scales absent.
486 (487) Body ovate; length of base of dorsal fin much less than height of fin.
Family **MOLIDAE**—Ocean sun-fishes
Ocean sun-fish *Mola mola*

487 (486) Body elliptical; length of base of dorsal fin much greater than height of fin.
Family **ICOSTEIDAE**—Rag-fishes
Brown rag-fish *Acrotus willoughbyi*

488 (437) Gill openings behind pectoral fins; body globular; large jointed appendage on snout.
Family **ONEIRODIDAE**—Sea-devils
Bulb-fish *Oneirodes bulbosus*

PLAN OF DESCRIPTIVE ARRANGEMENT

The fishes and fish-like vertebrates comprise groups or classes, three of which are represented in British Columbia waters. The first, Cyclostomata, or cyclostomes, includes the lamprey and the hag-fish. The second class, Selachii

(Elasmobranchii), or selachians, includes the sharks, rays and chimaeras. The third class, Pisces, or fishes, includes all the true fishes.

Each of the above classes is further divided into various groups and subgroups, the sequence of which is subclass, order, suborder and family. The various genera and species are arranged according to the above classification without the inclusion of generic descriptions which would involve many unnecessary discussions. The classification used herein follows essentially that adopted by C. Tate Regan of the British Museum.

The figures, with the exception of that of *Mola mola*, were drawn 8 inches in total length regardless of the original total length of the specimen and reduced to the sizes in the text.

For each species described there is a given common name followed by the scientific name, the name of the describer and the date of original description.

The scientific description has been made as concise as possible. Many technical terms have had to be used in order to obtain brevity and accuracy but these should present little difficulty if the glossary is consulted.

The length given is the greatest known to the authors through observation or by reference to the literature.

The paragraph "distinguished by" has been included to facilitate rapid recognition of the species.

The section on general information includes: the first record, distribution within the Provincial waters, the habitat, the abundance, the life history as far as known, the economic importance, etc.

In the review of the literature for occurrence it has been found that authentic first records are frequently difficult to trace. Throughout these pages the term "first taken" has been adopted to indicate the first specimen or specimens taken by any collector and studied by a competent authority.

Statements concerning the life history are brief, in many cases necessarily so because of the paucity of information.

The range as given for each species has been limited to that portion of the Pacific coast of North America from southern California to northwestern Alaska with little attempt to indicate the distribution in other regions.

Class I. **CYCLOSTOMATA**

The cyclostomes form a small group of fish-like animals most of which are predaceous on fishes. The body is elongate, almost cylindrical anteriorly, and is supported by a ribless cartilaginous skeleton which anteriorly forms an imperfect cranium. The skin is naked and is extended to form a median vertical fin fold supported by very slender cartilaginous rays. Paired fins and supporting girdles are never developed. The mouth is without jaws and is surrounded by a sucking disk with or without horny multicuspid plates. The tongue also bears similar plates. A single nostril, dorsal and median in position, is situated anterior to the eyes. The gill openings form a series of pores along each side of the body behind the eye. They open from gill pouches which are lined with branchial folds and supported by a lateral network of cartilage, known as the branchial basket.

The class Cyclostomata comprises two orders: Hyperoartia, lampreys; Hyperotreta, hag-fishes.

Order HYPEROARTIA

In this order the nostril is on the dorsal surface of the head and opens into a naso-pituitary passage which does not open into the pharynx. The eyes are rudimentary in the young but well developed in the adult. The gill pores are 7 in number on each side of the body, the first close behind the eye.

Family PETROMYZONIDAE Lampreys

In the lampreys the body is elongate and cylindrical and the mouth is surrounded by a circular suctorial disk armed with horny multicuspid plates.

Some species of lampreys attach themselves to fishes by means of the disk and by a rasping motion of the horny plates of the tongue cut into the flesh and feed upon the soft parts and body fluids. All young live in streams, are not predaceous, and after a metamorphosis descend to lakes or to the sea where they complete their development. However a number of species are restricted to fresh water. In certain lakes of British Columbia there occurs the small lamprey, *Lampetra planeri* Bloch, which is not predaceous and does not feed after attaining maturity.

Pacific lamprey *Entosphenus tridentatus* (Gairdner) 1836

Body elongate, somewhat cylindrical, compressed posteriorly. Head short; mouth surrounded by large circular horny sucking disk; horny plates: (*a*) on disk radiating from mouth, cusps numerous; (*b*) immediately surrounding mouth, 2, anterior tricuspid, prominent, posterior multicuspid, cusps small; (*c*) on tongue, prominent, rough, cusps small; jaws absent; barbels around mouth, none; nostril single, median, slightly anterior to eyes, without opening into pharynx; eye small. Gill pores, 7, first close behind eye. Anus below point posterior to origin of second dorsal fin fold. Paired fins absent. Fin folds: dorsal (2), median, high, distinctly separated; anal, (1), median, low, continuous around posterior end of body with caudal fin fold; caudal, somewhat rounded. Colour: dark bluish or brownish gray.

Length to 2 feet 3 inches.

Distinguished by the large horny sucking disk around the mouth, the horny plates with many cusps on the disk, mouth and tongue and the 7 gill pores on each side of the body commencing close behind each eye.

The Pacific lamprey was first recorded from British Columbia waters in 1891 by Ashdown Green as *Lampetra tridenata* (evidently a misprint for *tridentata*). The species is abundant along the entire coast. In August, 1936, an individual 24 inches in length was captured 20 miles off Barkley sound. The adults, 12 inches and upward in length, pass up the streams from the sea in large numbers during the spring months. They show great agility in overcoming obstructions such as waterfalls. Holding onto the smooth surface of a rock face, they let go at a favourable opportunity, swim vigorously upward and renew the hold. The procedure is repeated until eventually the obstruction is passed. They continue upstream until they reach riffles over gravel beds toward or near the headwaters, where they prepare nests. Here, by rapid movements of their bodies, they make a small mound of gravel in which their eggs are intermixed. Death usually occurs soon after spawning. The eggs hatch in a few weeks. The young, known as an *ammocoete*, burrows into the mud along the margin of the stream where it feeds upon vegetable material. It spends probably two or more years as a larva in the fresh water. During this period the larva differs in many structural respects from that of the adult, particularly in the presence of a projecting oral hood instead of a horny sucking disk surrounding the mouth. Toward the end of the fresh-water period the body changes to the adult form. Migration then takes place to the sea where begins a predaceous life of unknown duration. The Pacific lamprey attacks various fishes, salmon and steelhead trout in particular, attaching itself to the under side of the fore part of the body and sucking the body fluids. Many salmon and trout are taken each year showing the circular disk impressions of lampreys on fins and gill covers. These markings are sometimes mistaken by fishermen for "brands." While the Pacific lamprey is not marketed commercially there is no reason to believe that it is less edible than the European lamprey, which in early times was considered a great delicacy, and known as the diet of kings.

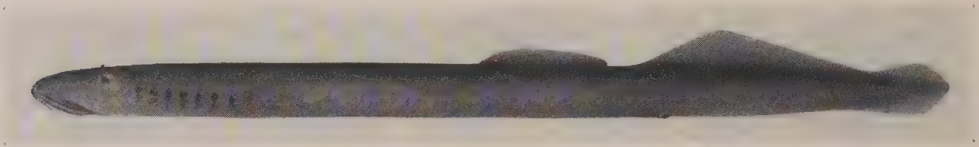

FIGURE 9. Pacific lamprey. *Entosphenus tridentatus* (Gairdner) 1836

Range southern California to northwestern Alaska.

Order HYPEROTRETA

In this order the nostril is at the anterior dorsal tip of the head, surrounded by 4 barbels, and opens into a naso-pituitary passage which in turn opens into the pharynx. The eyes are poorly developed. The gill pores are 10 to 14 in number on each side of the body, the first commencing remote from the eye.

Family MYXINIDAE Hag-fishes

In the hag-fishes the body is elongate and cylindrical and the mouth is surrounded by a fleshy sucking disk without horny multicuspid plates.

These animals burrow into the bodies of fishes and feed upon the internal parts. They inhabit the colder waters of the Pacific and do not enter fresh water.

Only one species is known from British Columbia waters but a second species, *Polistotrema deani* Evermann and Goldsborough, is recorded from off cape Flattery and from southeastern Alaska and will probably be taken in the future. This species differs from *P. stoutii* in having a much shorter head, a greater interspace between the anus and the ventral fin fold and more numerous horny plates in the mouth.

Hag-fish *Polistotrema stoutii* (Lockington) 1878

Body elongate, cylindrical, compressed posteriorly. Head short; snout pointed, depressed; mouth surrounded by small fleshy disk; horny plates with cusps on roof of mouth and on tongue; jaws absent; nostril single, large, median, terminal, with opening into pharynx; barbels around mouth, 4, around nostril, 4; eyes not visible but locations often marked by whitish areas. Gill pores, 10 to 14, first remote from eye. Skin: thin, smooth, loose. Anus large, near posterior end of body. Paired fins: absent. Fin folds: dorsal (1), far back, median, low, continuous with caudal; ventral, median, low, origin slightly posterior to last gill pore, insertion at anus; caudal broad, rounded. Mucus sacs numerous, in single series along each side of body. Colour: dark brown, often tinted with blue or purple (light brown in preservative); white on margins of fin folds.

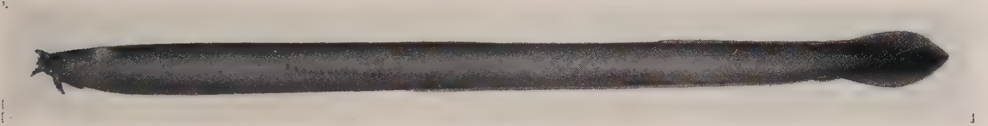

FIGURE 10. Hag-fish. *Polistotrema stoutii* (Lockington) 1878

Length to 2 feet 1 inch.

Distinguished by the flat pointed snout bearing 8 barbels, the small fleshy sucking disk, the covered eyes, the 10 to 14 gill pores on each side of the body commencing remote from the eye and the large anus very remote from the head.

The hag-fish was first taken in British Columbia waters in July, 1898, off the west coast of Vancouver island and was recorded in the same year by J. Fannin as *Polistotrema stouti* Lockington (evidently a misprint for *stoutii*). The specimen is now in the Provincial Museum at Victoria. The species is obtained occasionally along the west coast of Vancouver island. It has been captured in California waters at a depth of 455 fathoms. Little is known concerning the life history. Each egg is enclosed in a horny capsule which is spindle-shaped and approximately 1¼ inches in length and ⅜ of an inch in width. At each end there is a tuft of short hooked spines by which the egg cases are held together and attached to seaweeds. The hag-fish is a predaceous animal attacking large fishes into which it burrows and completely consumes the softer parts. Rock fishes, lingcod, flounders and sea-perches are recorded as being eaten and attacks on salmon have been reported.

Range southern California to southeastern Alaska.

Class II. **SELACHII**

The selachians are considerably diversified in their external shapes but actually are fundamentally similar. The skeleton is cartilaginous with primitive ribs and a complete braincase, or chondrocranium. Vertical and paired fins are present and are supported by cartilaginous rods at their bases from which radiate numerous unsegmented horny rays. The paired fins are attached to simple girdles. In the males, parts of the pelvic fins are modified to form claspers by means of which fertilization of the eggs within the bodies of the females is made possible. The mouth is ventral with well-developed jaws, the upper of which is not fused with the cranium. The nostrils are paired and located on the ventral surface of the head. The gill openings are elongate. The gill pouches are supported by cartilaginous arches.

The class Selachii comprises four subclasses, two of which embrace the living species, the Euselachii, sharks and rays, and the Holocephali, chimaeras and rat-fishes.

Subclass **EUSELACHII**

The members of this subclass have from 5 to 7 pairs of lateral or ventral exposed elongate gill openings. There is usually a small opening behind the eye, the spiracle, which is a remnant of a gill opening. The skin is very tough and has embedded in it numerous small placoid scales whose spines project and produce a roughened surface. These scales are covered with enamel and on the jaws are greatly enlarged and constitute the teeth.

This subclass is divided into two orders, the Pleurotremata, sharks, and the Hypotremata, skates and rays.

Order PLEUROTREMATA

In this order the body is elongate, spindle-shaped and approximately round in cross section. The caudal fin is heterocercal, that is, having lobes of unequal size surrounding the upturned end of the vertebral column. The pectoral fins have narrow bases and are free from the head and pelvic fins. A pair of spiracles is present, usually small in pelagic forms. The gill slits are on the sides of the body in front of the pectoral fins. The young are liberated from the bodies of the females after the yolk-sacs have been absorbed except in a few species which deposit eggs in flattened oblong horny cases on the sea bottom.

Suborder NOTIDANOIDEA

The sharks of this suborder have 6 or 7 gill slits on each side of the body and a single dorsal fin above the anal fin.

The cow sharks are bottom-living forms, mostly of warm seas; only six or seven species exist today but fossil species were numerous.

Spotted cow shark *Notorynchus cepedianus* (Péron) 1807

Body elongate, slender, rounded. Head depressed; snout broad, rounded; mouth, ventral. Spiracle large, nearer first gill slit than eye; gill slits, 7. Fins: dorsal (1), far back on body; anal, moderate; pelvic, abdominal; caudal heterocercal, elongate, upper lobe about 3 in total length from tip of snout to tip of caudal fin. Scales: placoid, minute. Colour: sandy gray to reddish brown with scattered round black spots.

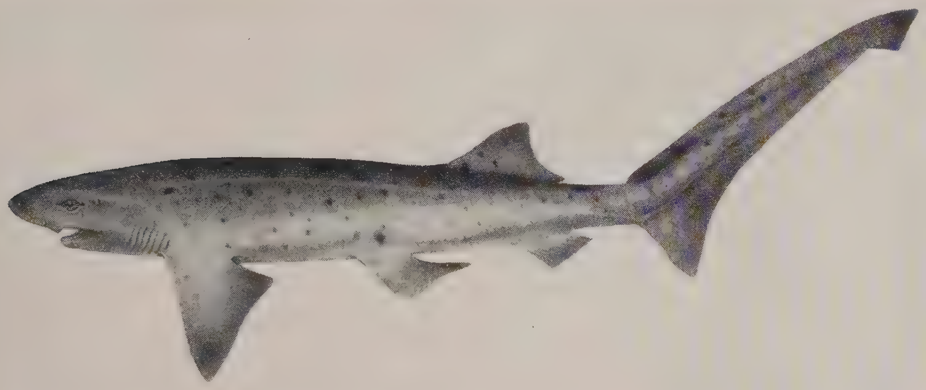

FIGURE 11. Spotted cow shark. *Notorynchus cepedianus* (Péron) 1807

Length to 8 feet.

Distinguished by the presence of 7 gill slits on each side of the body and the single dorsal fin.

The spotted cow shark was first taken in British Columbia waters in the spring of 1934 near Pender island by Mr. J. Shannon. This information was supplied by the second author to L. P. Schultz and A. C. DeLacy who recorded in 1935, in the errata to their *Fishes of the American Northwest*, under the name *Notorynchus maculatus* Ayres, this northward extension of the range. The species is obtained occasionally in otter trawls in the southern portion of the strait of Georgia, particularly in the vicinity of Pender island. In 1937 a specimen was caught near Butedale and in 1942 another was taken southwest of Bonilla island in 20 to 25 fathoms. Nothing is known concerning the life history.

Range southern California to northern British Columbia.

Mud shark *Hexanchus griseus* (Bonnaterre) 1788

Body elongate, stout, rounded. Head large, depressed; snout broad, blunt; mouth ventral. Spiracle large, nearer first gill slit than eye; gill slits, 6. Fins: dorsal (1), far back on body; anal, moderate; pelvic, abdominal; caudal, heterocercal, moderately elongate, upper lobe more than 3 in total length from tip of snout to tip of caudal fin. Scales: placoid, minute. Colour: dark gray, almost black in some instances, pale streak along side of body.

Length to 26 feet 5 inches.

Distinguished by the 6 gill slits on each side of the body and the single dorsal fin.

The mud shark was first taken in British Columbia waters in August, 1925, at Departure bay on a set-line. This specimen, a female 8¼ feet in length, was recorded in 1926 by C. H. O'Donoghue and L. L. Bolton as *Hexanchus corinus*. The species is particularly abundant in the strait of Georgia. The food consists of herring and various other fishes. The mud shark is captured frequently in purse-seines, especially during the herring fishing season, and is taken also on set-lines and in sunken nets, trawls and salmon-traps. It is made use of in reduction plants in the manufacture of meal and oil. It is known also as the shovel-nosed shark of California and the six-gilled shark or griset of European waters.

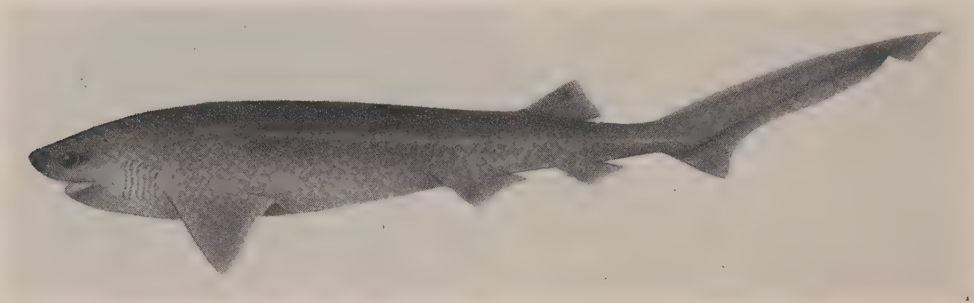

FIGURE 12. Mud shark. *Hexanchus griseus* (Bonnaterre) 1788

Range southern California to northern British Columbia.

Suborder GALEOIDEA

The sharks of this suborder have 5 gill slits on each side of the body, 2 dorsal fins and 1 anal fin.

Family LAMNIDAE Mackerel sharks

The mackerel sharks receive the name because of the possession of certain body characteristics somewhat similar to those of the mackerels, such as, the slender caudal peduncle usually with a strong keel on each side and a stream-lined form of body which makes possible very swift movement. They are pelagic sharks of wide distribution particularly in the northern seas.

Mackerel shark *Isurus nasus* (Bonnaterre) 1788

Body elongate, somewhat stout, rounded; caudal peduncle rather slender, keel on each side, prominent. Head moderate; snout prominent, pointed, slightly depressed; mouth ventral; teeth large, sharp; eye large, placed high. Spiracle minute, partially covered with fleshy flap, behind eye and above angle of mouth; gill slits, 5, length moderate, equal to distance from tip of snout to posterior margin of eye, fifth in front of pectoral fin. Fins: dorsal (2), first large, origin above pectoral fins, second small; anal, very small, length much less than that of first dorsal; pelvic, abdominal; caudal, heterocercal, lunate. Scales: placoid, minute. Colour: dark bluish gray on dorsal surface; abruptly white on ventral surface.

Length to 10 feet.

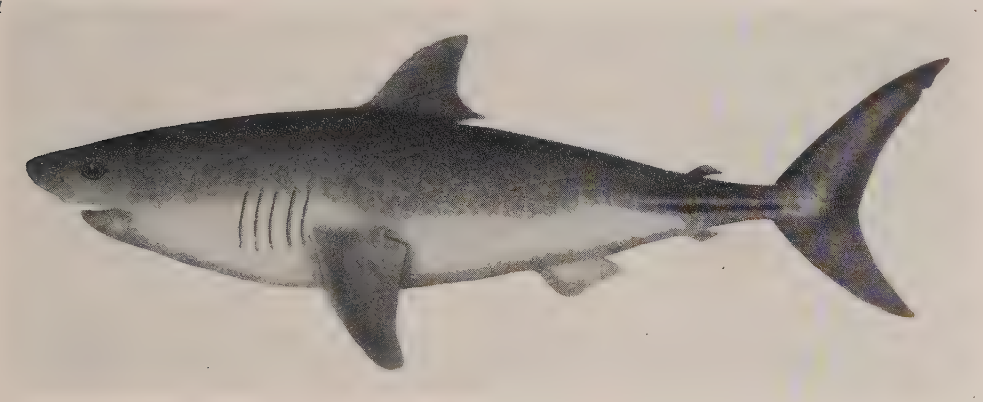

FIGURE 13. Mackerel shark. *Isurus nasus* (Bonnaterre) 1788

Distinguished by the keel on each side of the caudal peduncle and the gill slits of moderate length.

The mackerel shark was first taken in British Columbia waters in 1925 at Hippa island on a salmon-spoon and was recorded in 1930 by H. C. Williamson as *Lamna cornubica* Gmelin. This shark apparently is common along the coast from the strait of Georgia to Hecate strait. Individuals up to 8½ feet in length are abundant during the summer months off Mistaken island, near Parksville, where sportsmen have taken them on light tackle using salmon for bait. It is pelagic, swift swimming and said to be the most voracious of the northern sharks, feeding extensively upon salmon and other fishes. Although this shark has been called "man-eater" by some fishermen of the coast there is no authentic record of it having attacked a human being. It probably is the species which causes much damage to fishermen's nets.

Range northern California to northwestern Alaska.

Basking shark *Cetorhinus maximus* (Gunner) 1765

Body elongate, stout, rounded; caudal peduncle moderately slender, keel on each side prominent. Head moderate; snout blunt; mouth ventral; teeth numerous, very small, conical; eye small, placed low. Spiracle small, behind eye and above angle of mouth; gill slits, 5, very long, extending from back nearly to median line of ventral surface, fifth in front of pectoral fin; gill rakers long (4 to 6 inches in large individuals), slender, closely set, horny, somewhat resembling whalebone. Skin coarse, divided into irregular rectangles. Fins: dorsal (2), first large, pointed, about midlength of body; anal, very small, length much less than that of first dorsal; pelvic, abdominal, large; pectoral, large; caudal, heterocercal, lunate. Scales: placoid. Colour: bluish gray to brownish gray on dorsal surface; paler on ventral surface.

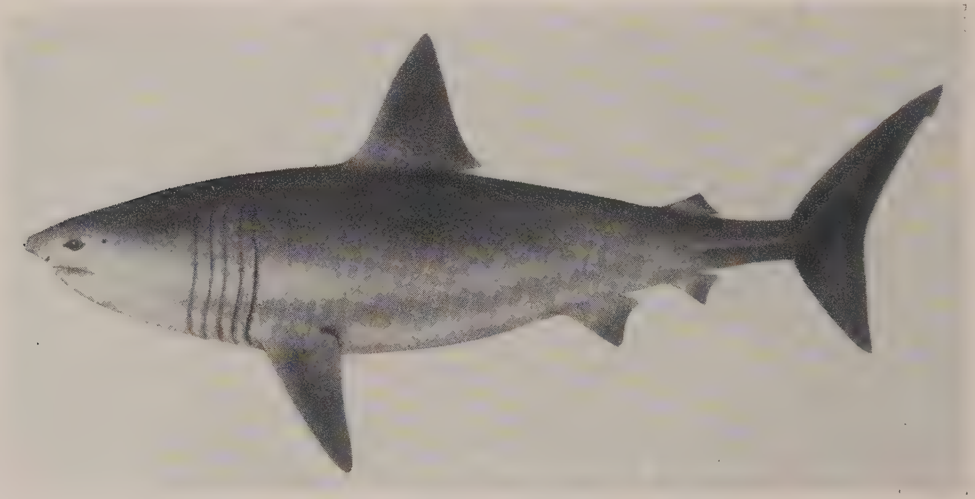

FIGURE 14. Basking shark. *Cetorhinus maximus* (Gunner) 1765

Length to 40 feet.

Distinguished by the keel on each side of the caudal peduncle, the large gill slits and the long slender horny gill rakers.

The basking shark was first recorded from British Columbia waters in 1891 from Queen Charlotte sound by Ashdown Green who stated that the species was well known to the Indians who occasionally killed individuals in this area. The cartilaginous skeletons are found rather frequently on beaches along the Pacific coast and are usually mistaken for remains of sea-serpents, particularly when the lower jaw is missing. In fact the name *Halsydrus* was given in 1809 to the remains of an unknown animal, believed to be a sea-serpent, cast up on the beach at Stronsay in the Orkney islands. A portion of the skeleton was preserved and later identified as possibly the vertebrae of a large basking shark. The species is fairly common in the open sea off the coast and is world-wide in its distribution. At certain times it is somewhat gregarious. Although of large size the basking shark is not ferocious. It swims through the water and, opening its large mouth, strains out small crustaceans and other animals by means of the array of closely set gill rakers. The common name has come from its habit of lying quite motionless at the surface in calm water with the large dorsal fin projecting.

Range southern California to northern British Columbia.

Thresher shark *Alopias vulpinus* (Bonnaterre) 1788

Body elongate, rounded; caudal peduncle short, stout, keel absent. Head moderate; snout somewhat blunt; mouth ventral; teeth small, flat, triangular, edges smooth; eye small. Spiracle minute, close behind eye; gill slits, 5, short, fifth above pectoral fin. Fins: dorsal (2), first large, pointed, second very small; anal, very small; pelvic, abdominal, moderate; pectoral large, falcate; caudal, heterocercal, exceedingly elongate, length about half total length from tip of snout to tip of caudal fin. Scales: placoid, minute. Colour: dark brownish gray to black on dorsal surface; white on ventral surface.

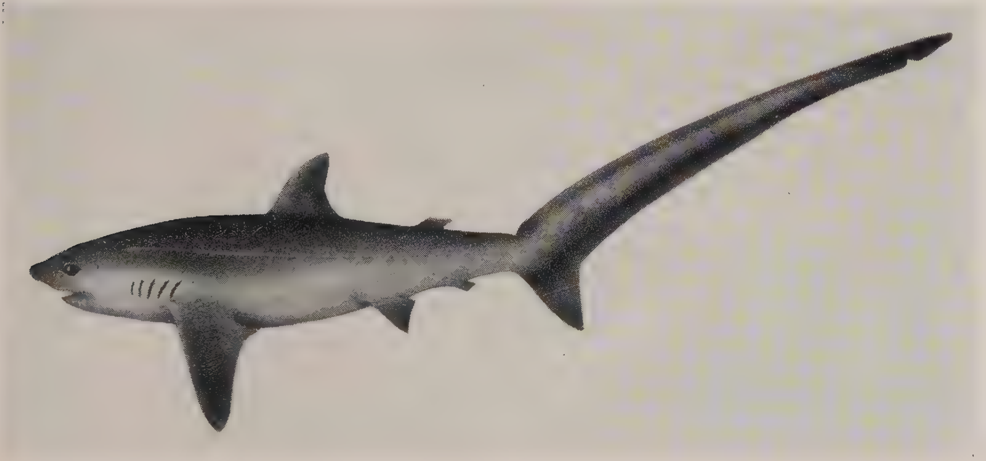

FIGURE 15. Thresher shark. *Alopias vulpinus* (Bonnaterre) 1788

Length to 25 feet.

Distinguished by the exceedingly elongate caudal fin.

The thresher shark was first taken in British Columbia waters July 19, 1937, at Otter point near Sooke. It was caught in a fish trap and was recorded in 1938 by I. McT. Cowan as *Alopias vulpes* (Gmelin). This specimen was 5 feet 8½ inches in length and is now in the Provincial Museum at Victoria. Other occurrences have been reported from time to time. This shark is a swift swimmer, feeding at or near the surface upon schooling fishes for the most part such as herring and pilchards. In feeding, it is said to swim in circles around the fish which become more or less concentrated because of the threshing movements of the tail. In spite of its large size the thresher shark is not known to be dangerous to human beings.

Range southern California to Juan de Fuca strait.

Family SCYLLIORHINIDAE Cat sharks

The cat sharks are small selachians characterized by having the upper lobe of the caudal fin in a straight line with the body instead of being turned upward as in other species, and by having the first dorsal fin above the pelvic fins. These sharks inhabit the southern seas and the species recorded from British Columbia apparently reaches its northern distribution in this area.

Brown shark *Apristurus brunneus* (Gilbert) 1891

Body elongate, rather slender, compressed; caudal peduncle very short, keel absent. Head elongate, much depressed; snout prominently angled above nostril; mouth ventral; teeth small, tricuspid, cusps slender. Spiracle large, close behind eye; gill slits, 5, fifth above pectoral fin. Fins: dorsal (2), close together, first over posterior of pelvic fins; anal large, length of base about twice that of first dorsal; pelvic, abdominal; caudal, modified heterocercal, not pointed upward. Scales: placoid, minute. Colour: dark brown; black on margins of fins.

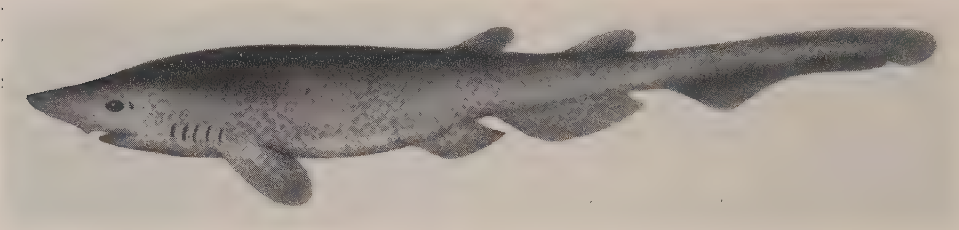

FIGURE 16. Brown shark. *Apristurus brunneus* (Gilbert) 1891

Length to 2 feet.

Distinguished by the posterior position of the first dorsal fin over the pelvic fins, the large anal fin and the non-upturned caudal fin.

The brown shark was first taken in British Columbia waters in 1907 near Nanaimo and the single specimen obtained was recorded in 1913 by F. Kermode as being in the collection of the Provincial Museum at Victoria. In April, 1941, several of these sharks were caught in the area south of Porlier pass and one was sent to the Pacific Biological Station for identification. A specimen 3⅛ inches in length was secured September 1, 1941, in English bay in a shrimp trawl. Another individual was caught on a dog-fish set-line in December, 1944, in

Howe sound at a depth of approximately 170 fathoms. Small numbers are taken on dog-fish gear in the straight of Georgia off the mouth of the Fraser river at depths of approximately 100 fathoms. From studies made in California waters it is known that the egg-case is slightly over two inches in length, oblong, compressed, with a long tendril at each of the four corners; the light brown covering is translucent so that the single white egg may be seen within.

Range southern California to strait of Georgia.

Family CARCHARINIDAE Blue sharks

The blue sharks are pelagic, usually bluish above and whitish below. They are widely distributed, very active and voracious. One member of the family, *Carcharinus nicaraguensis*, inhabits lake Nicaragua and is the only known strictly fresh-water shark.

Soup-fin shark *Galeorhinus galeus* (Linnaeus) 1758

Body elongate, slender, rounded; caudal peduncle short, slender, keel absent. Head depressed; snout long, pointed; mouth ventral. Spiracle small, close behind eye; gill slits, 5, fifth above pectoral fin. Fins: dorsal (2), size moderate; anal, small, length less than that of first dorsal; pelvic, abdominal; pectoral, length less than twice height of first dorsal, not sabre-shaped; caudal, heterocercal, upper lobe broad, lobule large. Scales: placoid, small. Colour: dark bluish to dusky gray on dorsal surface; paler on ventral surface; black on anterior portions of both dorsal fins, most of pectorals and tip of caudal fin.

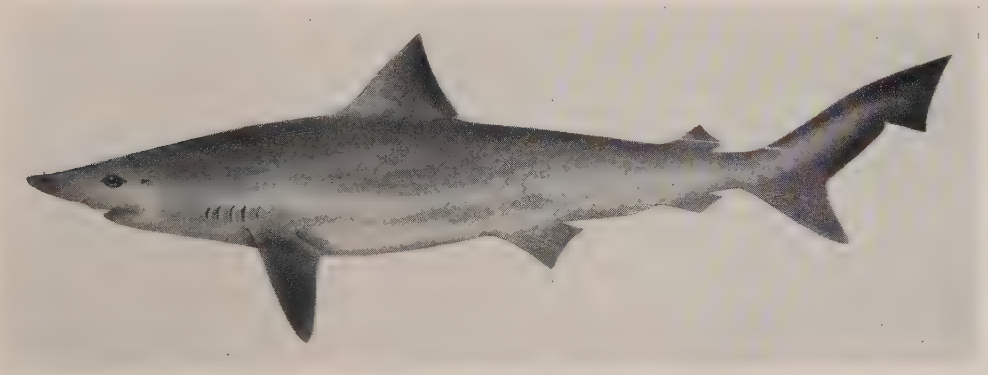

FIGURE 17. Soup-fin shark. *Galeorhinus galeus* (Linnaeus) 1758

Length to 6 feet.

Distinguished by the dark fins, the large lobule on the upper lobe of the caudal fin, the relatively short pectoral fins and the fifth gill slit on each side of the body above the pectoral fin.

The soup-fin shark was first recorded from British Columbia waters in 1891 by Ashdown Green who reported it to be rather common along the coast. When this shark was discovered in California it was described in 1883 as *Galeorhinus zyopterus* by Jordan and Gilbert. Dr. W. F. Thompson states that a specimen 5 feet 7 inches in length was obtained in October, 1914, off Banks island. A female 5 feet 9 inches in length, weighing 85 pounds and containing 19 young was caught August 18, 1926, in a salmon-trap near Sooke. Captures of considerable numbers by commercial fishermen have been reported from the west coast of Vancouver island since 1939. An individual taken off southern California contained 28 eggs, 14 in each oviduct, each about 4 inches in diameter and covered with a thin brownish membrane. The food is stated to consist in part of pilchards, anchovies, salmon, sea-perch, rock-fish and squid. The fins of this shark, because of their gelatinous rays, make a soup much prized by the Chinese in California and hence the common name. Recently the vitamin "A" content of the liver oil has been found to be very high and the fishery for this shark has greatly developed along the entire coast from California to British Columbia. Fishing takes place in about 25 fathoms with gill-nets or with set-lines baited with herring, suspended about 6 feet from the bottom. In European waters this shark is known as the tope.

Range southern California to northern Columbia.

Blue shark *Prionace glauca* (Linnaeus) 1758

Body elongate, slender, rounded; caudal peduncle short, slender, keel absent. Head depressed; snout long, pointed; mouth ventral. Spiracle small, inconspicuous, close behind eye; gill slits, 5, fifth above pectoral fin. Fins: dorsal (2), size moderate; anal small, length less than that of first dorsal; pelvic, abdominal; pectoral large, length equal to twice height of first dorsal, sabre-shaped; caudal

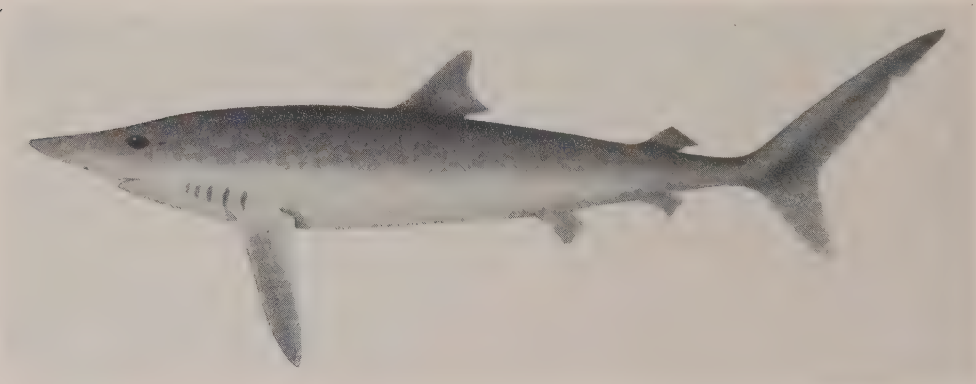

FIGURE 18. Blue shark. *Prionace glauca* (Linnaeus) 1758

heterocercal, upper lobe slender, lobule small. Scales: placoid, small. Colour: bluish gray on dorsal surface and on fins; almost white on ventral surface.

Length to 25 feet.

Distinguished by the long sabre-shaped pectoral fin, the small lobule on the upper lobe of the caudal fin and the fifth gill slit above the pectoral fin.

The blue shark apparently was first recorded from British Columbia waters in 1930 by H. C. Williamson who reported observing a blue shark, "probably *Prionace glauca*", and who stated that individuals were frequently caught in 1925 by trollers along the west coast of Vancouver island. It would seem to be rather common along the west coast of Vancouver island as it is taken frequently during the herring and pilchard operations. Little is known of the life history but the young are born, as many as 30 at a time. Since it is a very active shark it feeds upon whatever fishes it may encounter, even those in fishermen's nets and hence is considered extremely voracious.

Range southern California to southern British Columbia.

Suborder SQUALOIDEA

The sharks in this suborder have 5 gill slits on each side of the body, 2 dorsal fins and no anal fin.

Family SQUALIDAE Dog-fishes

The dog-fishes are small sharks abounding in all seas and frequently occurring in very large schools. There is a stout sharp spine in front of each dorsal fin. The sleeper shark, which is included in this family, is a large sluggish selachian of world-wide distribution. No spines precede the dorsal fins of this species.

Dog-fish *Squalus suckleyi* (Girard) 1854

Body elongate, rather slender, rounded; caudal peduncle long, slender. Head depressed; snout pointed; mouth ventral. Spiracle large, close behind eye; gill slits, 5. Fins: dorsal (2), each with large spine anteriorly; anal, absent;

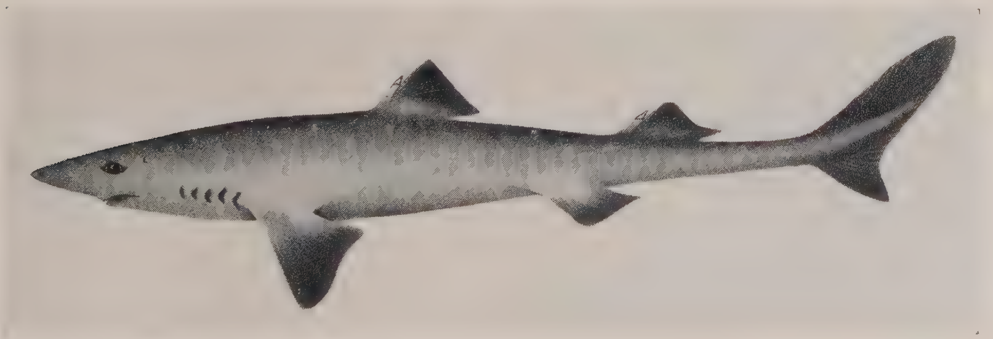

FIGURE 19. Dog-fish. *Squalus suckleyi* (Girard) 1854

pelvic, abdominal; caudal, heterocercal, upper lobe broad. Scales: placoid, minute. Colour: gray or light brown on dorsal surface; dirty white on ventral surface; white spots on back of young.

Length to 5 feet 3 inches.

Distinguished by the presence of a large spine in front of each dorsal fin and the absence of an anal fin.

The dog-fish was first recorded from British Columbia waters in 1866 without date or locality of capture by J. K. Lord as *Acanthius Suckleyi* (evidently a misprint for *Acanthias*). The first specific record is that of a specimen taken July 27, 1881, at Drew harbour by Capt. H. E. Nichols and recorded in the same year by T. H. Bean as *Squalus acanthias* Linnaeus. The species is exceedingly abundant along the whole coast, appearing in large numbers where herring school and occasionally may be observed swimming at the surface with the dorsal fins exposed, particularly where "pink" feed is abundant. The female attains a greater length and weight than does the male and produces from 3 to 14 young at a time in alternate years. The dog-fish feeds upon practically all of the smaller fishes, especially herring, pilchards, anchovies, smelts, sand-lances, and occasionally young dog-fish, squid as well as pelagic crustaceans when they occur in large numbers. It is also a scavenger, feeding upon offal from fish canneries and reduction plants and refuse dumped at sea. It is caught with gill-nets and set-lines and is used extensively for the production of oil and meal. Since the oil from the liver has been found to have a high vitamin "A" content the capture of dog-fish has developed into a very profitable fishery. The nitrogen content of the meal makes it particularly valuable as a fertilizer. It may be of interest to know that prior to 1880 a reduction plant was in operation at Skidegate for the manufacture of oil from dog-fish livers. This shark is sometimes referred to as gray-fish.

Range southern California to northwestern Alaska.

Sleeper shark *Somniosus microcephalus* (Schneider) 1801

Body elongate, stout, deep anteriorly, rounded. Head large; snout blunt; mouth ventral. Spiracle large, close behind eye; gill slits, 5. Fins: all relatively small; dorsal (2), not preceded by spines, second elongate, flabby; anal, absent; pelvic, abdominal; caudal heterocercal, lobes broad. Scales: placoid, minute. Colour: gray to sooty black.

Length to 25 feet.

Distinguished by the flabby second dorsal fin, the absence of an anal fin and the absence of a spine from the anterior margin of each dorsal fin.

The sleeper shark was first recorded from British Columbia waters in 1881 from Victoria by D. S. Jordan and C. H. Gilbert who observed a specimen 8 feet in length. A second specimen 11 feet 6 inches in length was found January 29, 1934, on Comox spit. Since the latter date a number of individuals have been reported from various parts of the strait of Georgia. The sleeper shark is a large and sluggish denizen of the bottom. Little is known of the early life history and whether it deposits eggs or liberates young is uncertain. It is rapacious, feeding upon almost anything of an animal nature as well as upon carrion.

Range southern California to northwestern Alaska.

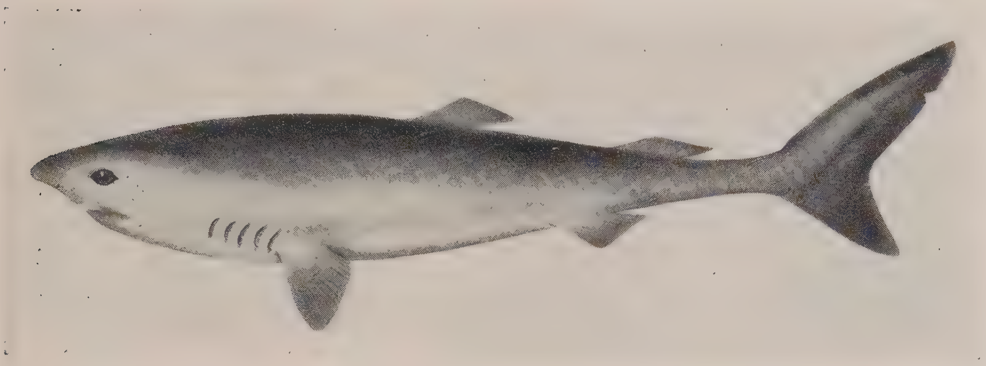

FIGURE 20. Sleeper shark. *Somniosus microcephalus* (Schneider) 1801

Order HYPOTREMATA

In this order the body proper is elongate, depressed and almost elliptical in cross section. The pectoral fins have wide bases which are greatly extended and each is attached along the side of the body from the tip of the snout to the anterior margin of the pelvic fin. The rhythmical wave-like motion of these fins produces fairly rapid movements. There is no anal fin. A pair of large spiracles is present and dorsal in position. The gill slits are on the ventral surface of the body. The eggs are fertilized internally. In the skates (Rajidae), the eggs are laid in horny cases, while in the sting and electric rays the young develop within the female and are released at or about the time the yolk-sac is absorbed.

Suborder BATOIDEA

The rays in this suborder have the body extended posteriorly to form a long slender tail, usually without a caudal fin. The pectoral fins are attached to the snout but are not continuous around it. Scales are usually present. Electric organs, if present, are small, weakly developed and situated on the body at the base of the tail.

The term ray is applied to all members of the suborder Batoidea, while the term skate is usually restricted to the members of the family Rajidae.

In this suborder there are two families, the Rajidae, or skates, and the Trygonidae, or sting rays.

Family RAJIDAE Skates

In the skates the body is extended posteriorly into a long slender tail on each side of which is a longitudinal fold. There are two dorsal fins placed far back on the tail.

The skates are represented by many species, all inhabiting cool seas and sometimes extending into very deep water. They live, for the most part, on muddy bottoms where they may lie motionless or with gentle undulations of the pectoral fins. When swimming they may attain considerable speed.

Long-nosed skate *Raja rhina* Jordan and Gilbert 1880

Body elongate, slender, depressed; tail slender. Outline between tip of snout and tip of pectoral fin concave so that a line drawn between these two points lies almost wholly without fin outline. Head depressed; snout long, sharply pointed, supported by firm cartilage; mouth ventral. Spiracle large, close behind eye; gill slits, 5, on ventral surface. Fins: dorsal (2), far back on tail; anal, absent; pelvic, abdominal, each with deep acute notch when extended; pectoral broad, attached to snout; caudal, absent. Scales: placoid, minute. Spines: on mid-dorsal line large, confined to tail except for single stout spine short distance behind eyes; in male, in patch near tip of each pectoral fin extending near margin towards snout, large, sharp. Colour: mostly uniform brown on

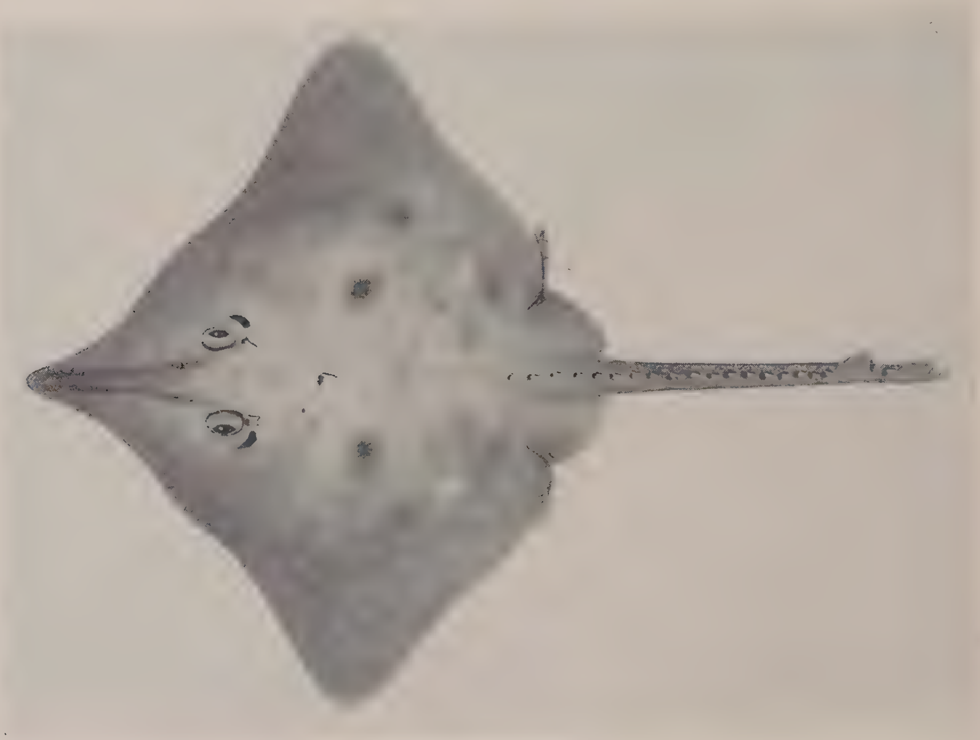

FIGURE 21. Long-nosed skate. *Raja rhina* Jordan and Gilbert 1880

dorsal surface; muddy blue on ventral surface; black ring at base of each pectoral fin; small white spot posterior to each ring.

Length to 4 feet 6 inches.

Distinguished by the long pointed snout, the angular outline of the body, the deep acute notch in each pelvic fin when extended and the muddy blue colour on the ventral surface of the body.

The long-nosed skate was first recorded from British Columbia waters in 1891 by Ashdown Green, although Jordan and Gilbert, in 1881, gave the range as from Monterey to Vancouver island. The egg-cases are 3 to 5 inches in length, possess tendrils, and usually contain one egg only. The pectoral fins of long-nosed skates are sold as "wings." Although these appear on the market they are generally considered as less palatable than those of the big skate.

Range southern California to southeastern Alaska.

Big skate *Raja binoculata* Girard 1854

Body elongate, slender, depressed; tail slender. Outline between tip of snout and tip of pectoral fin slightly concave so that a line drawn between these two points lies almost wholly without fin outline. Head depressed; snout long,

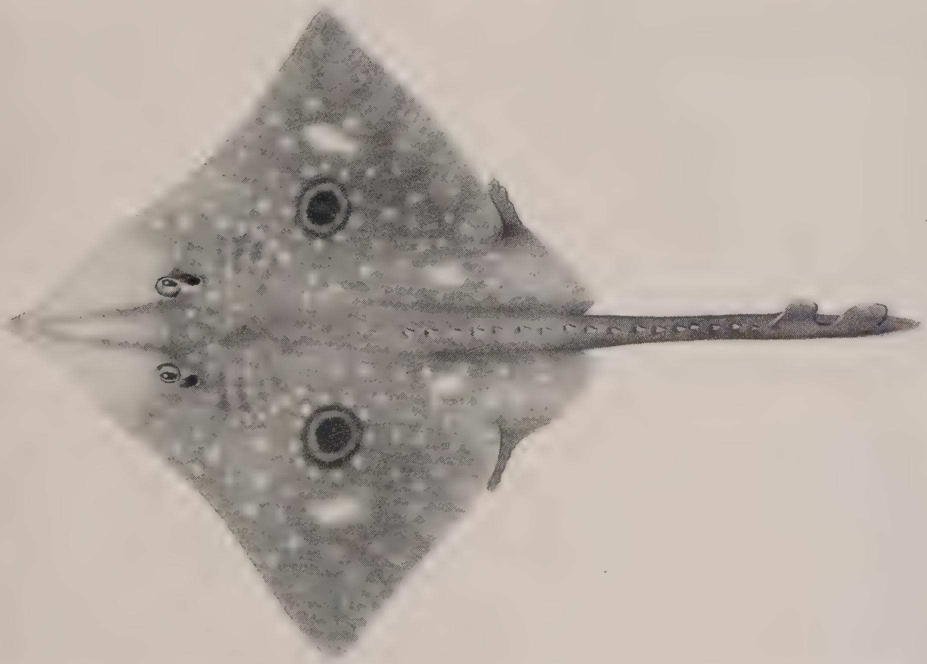

FIGURE 22. Big skate. *Raja binoculata* Girard 1854

somewhat pointed, supported by firm cartilage; mouth ventral. Spiracle large close behind eye; gill slits, 5, on ventral surface. Fins: dorsal (2), far back on tail; anal, absent; pelvic, abdominal, with slight obtuse concavity when extended; pectoral broad, attached to snout; caudal, absent. Scales: placoid, minute. Spines: on mid-dorsal line large, confined to tail except for single stout spine short distance behind eyes; in male, in patch near margin of each pectoral fin extending from snout to beyond tip, large, sharp. Colour: dull olive brown or gray to nearly black in large individuals, on dorsal surface; white on ventral surface; large dark ocellus, or "eye-spot", at base of lighter area which in turn contains a central darker area; light spots as large as eye scattered over body and smaller light spots forming ring around each ocellus; in young, light ring of ocellus conspicuously red.

Length to 8 feet.

Distinguished by the shallow obtuse concavity in each pelvic fin, the ocellus at the base of each pectoral fin and the white ventral surface of the body.

The big skate was first taken in British Columbia waters in 1880 at Victoria and recorded in the same year by D. S. Jordan and C. H. Gilbert as *Raia cooperi.* It is abundant along the whole coast. The egg-cases of large individuals are about 1 foot in length, do not possess tendrils, and may contain from 2 to 7 eggs. A case obtained January 1, 1939, in Active pass at a depth approximately 40 fathoms contained 4 eggs which were in the very early stages of segmentation. On October 5, 1941, a female, about 5 feet in length, laid two egg-cases in the Vancouver Aquarium and on the 9th she deposited two more, but none of the eggs hatched. There would seem to be some evidence that egg deposition may take place throughout the year, since freshly deposited egg-cases have been dragged up in trawls from early January to late summer in the strait of Georgia. It is likely that the young remain in the cases for approximately a year. The food of this skate consists in part of crustaceans and fishes, including the great sculpin, *Myoxocephalus polyacanthocephalus*, two specimens of which, each about one foot in length, were taken from the first recorded individual mentioned above. The big skate is the largest of the skates in these waters and is important commercially as its "wings" are sold in considerable quantities.

Range southern California to northwestern Alaska.

Prickly skate *Raja stellulata* Jordan and Gilbert 1880

Body elongate, slender, depressed; tail slender; outline between tip of snout and tip of pectoral fin convex so that a line drawn between these two points lies wholly within fin outline. Head depressed; snout bluntly pointed, supported by weak cartilage; mouth ventral. Spiracle large, close behind eye; gill slits, 5, on ventral surface. Fins: dorsal (2), far back on tail; anal, absent; pelvic, abdominal, each with deep notch; pectoral broad, attached to snout; caudal, absent. Scales: placoid, small, stellate. Spines: on mid-dorsal line in continuous row from slightly behind eyes to first dorsal fin, large; on shoulder girdle near middle of body, about 6, large; on orbital rim in row, small; stout; in male, in patch near tip of each pectoral fin extending near margin towards snout, large, sharp. Colour: grayish brown; black spots numerous, small, of various sizes, scattered over body; pair of large "eye-spots", somewhat as in *Raja binoculata*, may be present in some specimens.

Length to 2 feet 6 inches.

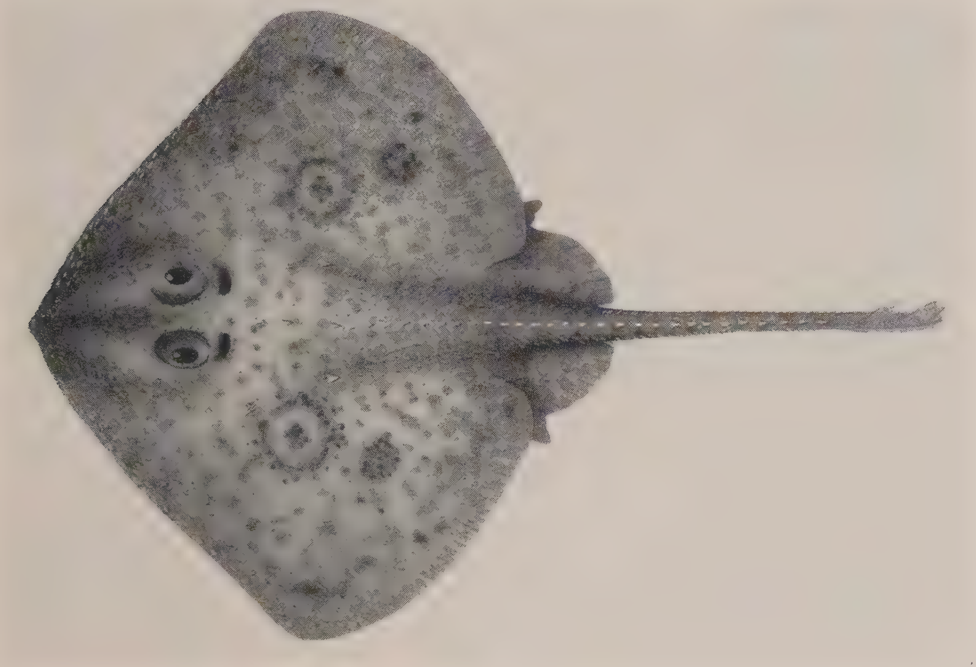

FIGURE 23. Prickly skate. *Raja stellulata* Jordan and Gilbert 1880

Distinguished by the weak snout, the continuous row of spines on the mid-dorsal line of the body, the row of spines on each orbital rim and the small stellate scales on the body.

The prickly skate was first taken in British Columbia waters August 28, 1891, west of Port San Juan by the *Albatross*, station 3447, lat. 48° 30′ N., long. 124° 36′ W., depth 116 fathoms, and recorded in 1895 by C. H. Gilbert. This skate has also been secured in the strait of Georgia, at Ucluelet and off the Queen Charlotte islands. Little is known of the life history but two small individuals, less than five inches in length with the yolk-sac still attached, were obtained in June and July, 1909, at Ucluelet.

Range southern California to northwestern Alaska.

Black skate *Raja kincaidii* Garman 1908

Body elongate, slender, depressed; tail slender. Outline between tip of snout and tip of pectoral fin convex so that a line drawn between these two points lies wholly within fin outline. Head depressed; snout bluntly pointed, supported by weak cartilage; mouth ventral. Spiracle large, close behind eye; gill slits, 5, on ventral surface. Fins: dorsal (2), far back on tail; anal, absent; pelvic, abdominal, each with moderate notch; pectoral broad, attached to snout; caudal, absent. Scales: placoid, closely set, small. Spines: on mid-dorsal line, in continuous row from behind head to first dorsal fin, 27 to 33, very large; on shoulder girdle near middle of body, 1 or 2, large; on orbital rim, none; in male, in patch near tip of each pectoral fin extending near margin towards snout, large, sharp. Colour: slaty black in adult, leaden brown in young with small brown to black spots, on dorsal surface; white on ventral surface; white spot on each side of tail near seventeenth to nineteenth spines, which may not be evident in larger specimens.

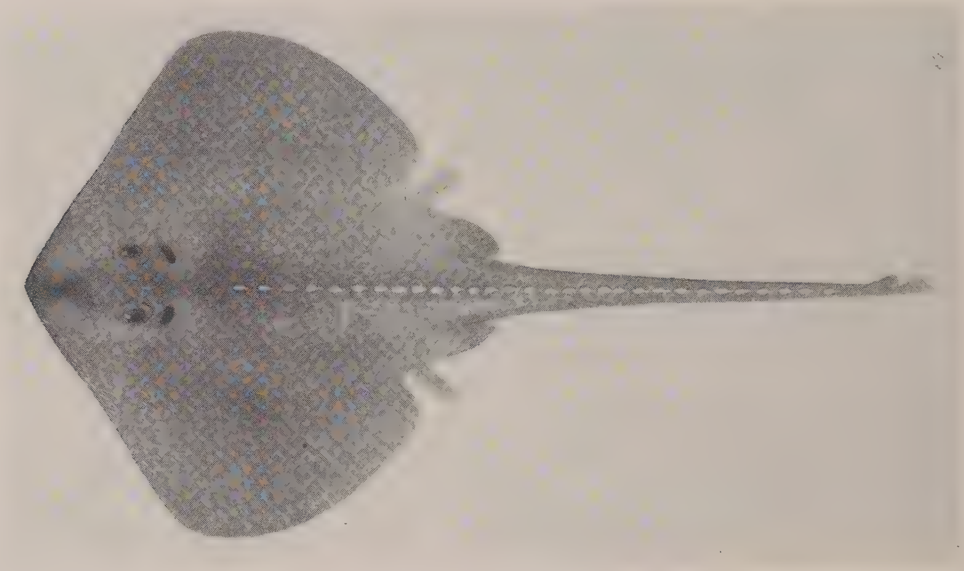

FIGURE 24. Black skate. *Raja kincaidii* Garman 1908

Length to 2 feet 9 inches.

Distinguished by the weak snout, the continuous row of spines on the mid-dorsal line, the 1 or 2 spines on the shoulder girdle and the absence of spines from each orbital rim.

The black skate was first taken in British Columbia waters December 11, 1936, in Trincomali channel, near Porlier pass, in an otter trawl by Dr. J. L. Hart and the specimen is now in the collection of the Pacific Biological Station. Two individuals obtained from Porcher island in Oval bay by Dr. W. F. Thompson, and now in the collection of the United States National Museum at Washington, D.C., were recorded in 1937 by L. P. Schultz. A fourth individual was secured February 26, 1941, in Satellite channel by Dr. G. C. Carl and is now in the Provincial Museum at Victoria.

Range southern California to northern British Columbia.

Deep-sea skate *Raja abyssicola* Gilbert 1895

Body elongate, slender, depressed; tail slender. Outline between tip of snout and tip of pectoral fin convex so that a line drawn between these two points lies wholly within fin outline. Head depressed; snout bluntly pointed, supported by weak cartilage; mouth ventral. Spiracle large, close behind eye; gill slits, 5, on ventral surface. Fins: dorsal (2), high, far back on tail; anal, absent; pelvic, abdominal, each with moderate notch; pectoral broad, attached to snout; caudal, absent. Scales: placoid; on dorsal surface of body, closely set, with long slender bristle-like spines. Spines: on mid-dorsal line, large; confined to tail except for three stout spines near middle of body; on shoulder girdle, none; on orbital rim, none; in male, in patch near tip of each pectoral fin. Colour: uniform brown.

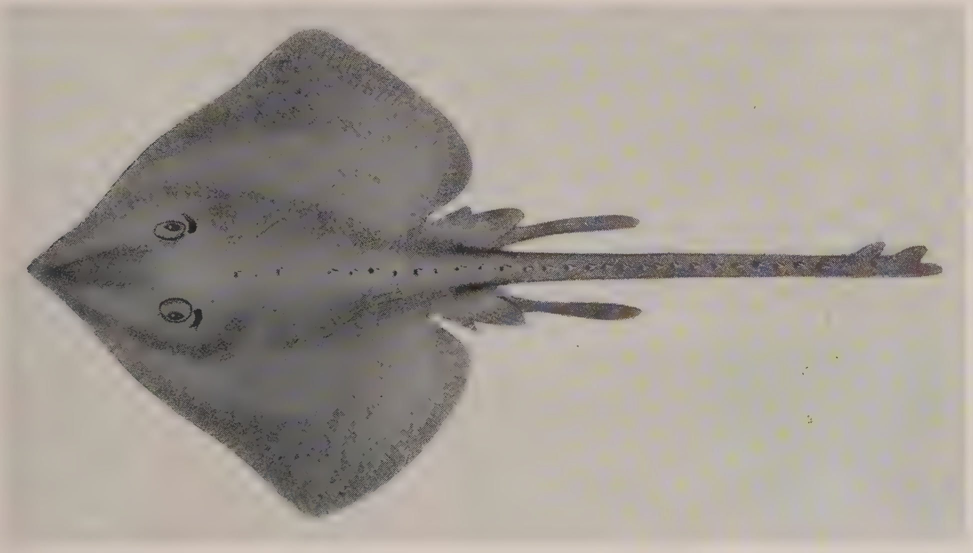

FIGURE 25. Deep-sea skate. *Raja abyssicola* Gilbert 1895

Length to 4 feet 6 inches.

Distinguished by the weak snout, the continuous row of spines on the mid-dorsal line of the tail only, the three stout spines on the mid-dorsal line of the body and the absence of large spines from each shoulder girdle.

The deep-sea skate is represented by a single specimen taken September 3, 1890, west of Moresby island by the *Albatross*, station 3342, lat. 52° 39′ N., long. 132° 38′ W., depth 1,588 fathoms, recorded in 1895 by C. H. Gilbert. This individual is the type (a male), the only one known and is deposited in the United States National Museum. Dr. Gilbert remarked that this was the greatest depth recorded for any species of skate.

Range off the west coast of the Queen Charlotte islands.

Family TRYGONIDAE Sting rays

In the sting rays the body is extended posteriorly into a very long slender tail which is whip-like with a sharp serrated spine on its dorsal surface; lateral longitudinal folds are usually absent. Dorsal and caudal fins are usually absent.

In some species, at least, a powerful poison is secreted along the side of the tail spine and may cause serious illness.

The species are numerous in the warm seas and some may even ascend rivers for some considerable distances.

Rat-tailed sting ray *Dasyatis dipterurus* Jordan and Gilbert 1880

Body greatly elongate, depressed anteriorly; very slender posteriorly, produced into whip-like tail one and a half times length of body; outline between tip of snout and tip of pectoral fin convex so that a line drawn between these two points lies wholly within fin outline. Head depressed; snout somewhat pointed; mouth ventral. Spiracle large, close behind eye; gill slits, 5, on ventral surface. Skin: on tail, in small fold above, in conspicuous fold below. Fins: dorsal, absent; anal, absent; pelvic, abdominal, notch absent; pectoral broad, attached

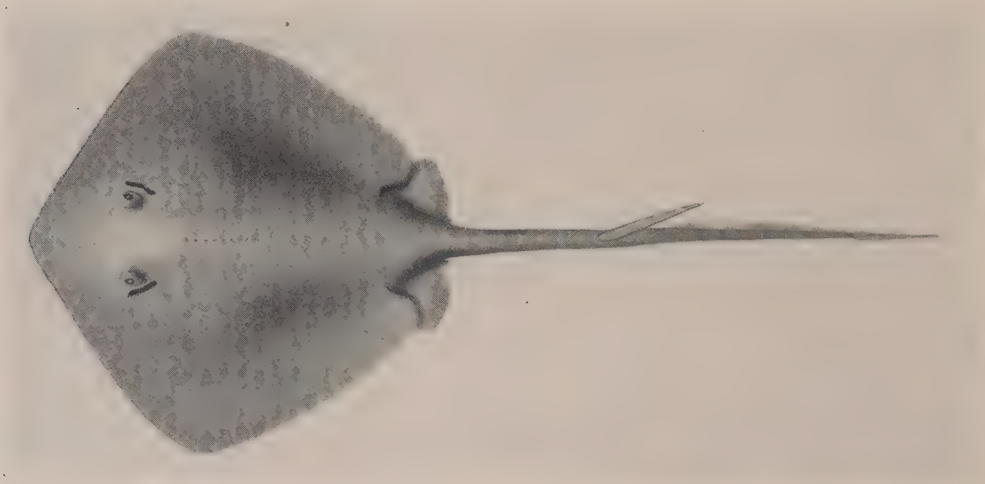

FIGURE 26. Rat-tailed sting ray. *Dasyatis dipterurus* Jordan and Gilbert 1880

to snout. Scales: placoid, minute. Tubercles: on mid-dorsal line of body in short row, large. Spine: on dorsal surface of tail, about one-third distance from body to tip of tail, long, stout, sharp, serrate. Colour: bluish brown.

Length to 6 feet.

Distinguished by the whip-like tail with the long sharp serrated spine.

The rat-tailed sting ray was first reported from British Columbia waters by Dr. H. C. Williamson as taken at various times during the summer of 1928 off Kyuquot, Vancouver island, on salmon gear. The record was published in 1930 as *Dasyatis* sp. and there would seem to be no doubt of the species being *D. dipterurus*. This ray is much feared by fishermen. The stout spine on the flexible tail is a very dangerous weapon which can produce a wound in which bacterial infections may develop if particular care is not taken. The food consists in part of crabs and molluscs.

Range southern California to Kyuquot, British Columbia.

Suborder NARCOBATOIDEA

The rays in this suborder have the body extended posteriorly to form a short stout tail with a well developed caudal fin. The pectoral fins are confluent around the tip of the snout. Scales are absent. Electric organs are large, located on either side of the head.

There is a single family, the Torpedinidae.

Family TORPEDINIDAE Electric rays

In the electric rays the body is depressed and broad and produced posteriorly behind the pelvic fins into a short stout portion usually referred to as the tail. On the tail are two large dorsal fins and a well developed caudal fin. The skin is entirely smooth and devoid of scales.

The outstanding peculiarity of these fish is the possession of a pair of large electric organs located on either side of the head and capable of giving a strong electric shock. These organs are derived from certain muscles which have greatly changed in structure and function. This modification apparently is an elaboration of the minute electrical discharge which accompanies all muscular contractions. The following description is based upon that given in "*A History of Fishes*," by J. R. Norman:—The organ is composed of a large number of upright hexagonal tubes or columns, separated from one another by walls of fibrous tissue and containing a clear jelly-like substance. In essence it is a series of electric cells whose combined output of electricity is said to be sufficient to paralyze temporarily the arm of a man or to knock him down if he accidentally steps on one of these fish as it lies partly buried in the sand. The fish must be touched at two points in order to obtain the full effect of the shock. The discharge is given to animals coming in contact with the ray according to the distance apart of the points touched and the size of the area involved. This shocking mechanism is no doubt a protective device but it may also provide the ray with a portion of its food. In European waters, eels, flounders and Atlantic salmon have been found in the stomachs.

The electric rays have their centre of abundance in warm seas.

Electric ray *Tetranarce californica* (Ayres) 1855

Body elongate, somewhat expanded anteriorly, depressed; tail short, stout, compressed posteriorly; outline of body and pectoral fins rounded, very broad, almost truncate anteriorly. Head depressed; snout bluntly rounded; mouth ventral. Spiracle large, close behind eye; gill slits, 5, on ventral surface. Skin entirely smooth. Fins: dorsal (2), far back on body; anal, absent; pelvic, abdominal; pectoral greatly convex, confluent around tip of snout; caudal, truncate, expanded. Scales: absent. Colour: bluish gray, or brownish gray on dorsal surface with many small round black spots; dusky gray on ventral surface.

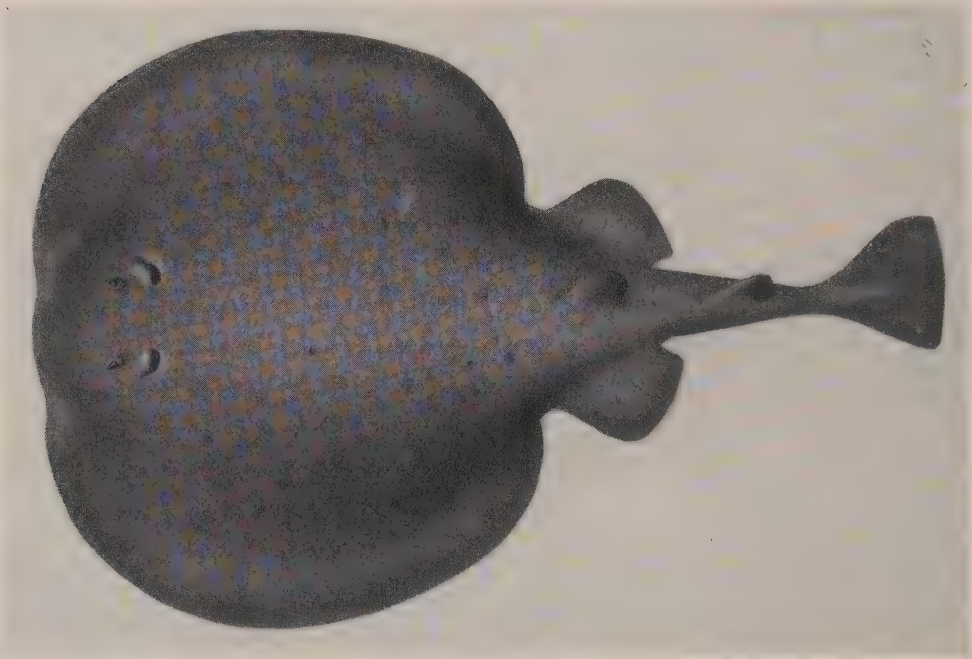

FIGURE 27. Electric ray. *Tetranarce californica* (Ayres) 1855

Length to 3 feet.

Distinguished by the almost circular body outline, the short stout tail and the smooth bluish gray skin with small round black spots.

The electric ray was first taken in British Columbia waters in July, 1928, at Kyuquot on a salmon-trolling spoon and was recorded in 1930 by H. C. Williamson. A second individual was obtained September 1, 1928, at Nootka, and is now in the collection of the Pacific Biological Station. In 1938, 1940 and 1941 several other individuals were reported from the west coast of Vancouver island. Two specimens from the west coast of Vancouver island were on display in the Vancouver Aquarium for several weeks during June and July, 1941. Each was about three feet in length. Additional records are: Cowichan bay, 1933; Sattelite channel and Saanich arm, 1942. The food of the individual taken in Cowichan bay consisted entirely of herring. A weight of over 50 pounds has been recorded.

Range southern California to southern British Columbia.

Subclass **HOLOCEPHALI**

The members of this subclass have a single gill opening on each side of the body covered with a fleshy flap, or operculum, which is not supported by bony plates as in the fishes. There are no spiracles. The skin is smooth, without scales. The jaws have teeth confluent into bony plates.

There is but one family in the subclass Holocephali, the Chimaeridae.

Family CHIMAERIDAE — Chimaeras

The chimaeras have large heads, pointed to bluntly rounded snouts, prominent incisor-like teeth, bodies tapering gradually posteriorly and large paddle-like pectoral fins. The eggs are deposited in spindle-shaped horny cases.

The weird appearance of the members of this family has led to the designation chimaera, referring to the fabulous monster with the head of a lion, the body of a goat and the tail of a serpent.

There is only one representative of the family in British Columbia waters, the rat-fish, *Hydrolagus colliei.* The word *Hydrolagus* means water-hare, referring to the somewhat rabbit-like mouth.

Rat-fish *Hydrolagus colliei* (Lay and Bennett) 1839

Body elongate, stoutish anteriorly, tapering gradually to point posteriorly. Head large, slightly compressed; snout blunt, projecting; mouth ventral, small, upper lip notched; teeth united into groups of bony plates, incisor-like, on upper jaw, 4, on lower jaw, 2; nostrils, 2, immediately anterior to mouth; eye large; operculum fleshy, forming single opening from gill chamber. Skin: thin, smooth. Fins: dorsal (2), first triangular, with long, stout, grooved, serrate spine at anterior margin, second long, low, broadly notched; anal, absent; pelvic, abdominal; pectoral, large, paddle-shaped; caudal, long, lanceolate. Scales: absent. In male, club-shaped spiny process on head above snout fitting into depression; long clasper behind each pelvic fin, shorter clasper in front of each pelvic fin lying in sheath. Colour: silvery, reflecting golden metallic pale brown and other hues.

Length to 3 feet 2 inches.

Distinguished by the large head with a blunt snout, the incisor-like teeth, the smooth skin, the long lanceolate caudal fin and the fleshy gill covers.

The rat-fish was first recorded from British Columbia waters in 1866 by J. K. Lord as *Chimaera Colleii* (evidently a misprint for *colliei*). This was an adult male from Esquimalt harbour, as recorded subsequently in 1870 by A. Günther. The species is very common along the whole coast usually at depths below 40 fathoms. The eggs are deposited in elongate, ridged, brown capsules about 5 inches in length. These have been observed by Dr. A. L. Pritchard set upright in the mud in the intertidal zone in Massett inlet. The young, when they leave the egg-cases, are small replicas of the adults and are commonly obtained in late October and November in shrimp trawls. The adult is taken on set-lines, in purse-seines and by otter trawls, frequently in large numbers, particularly in October. The rate of growth and age attained are unknown. The food of the rat-fish consists largely of fishes, but in part of mussels and other invertebrates. The liver oil is readily extracted by mild heating. It is clear and of a slightly yellowish colour and produces no gummy residue. It is used for cleaning guns and undoubtedly could be used to a considerable extent commercially as it is an excellent lubricant and has no objectionable odour.

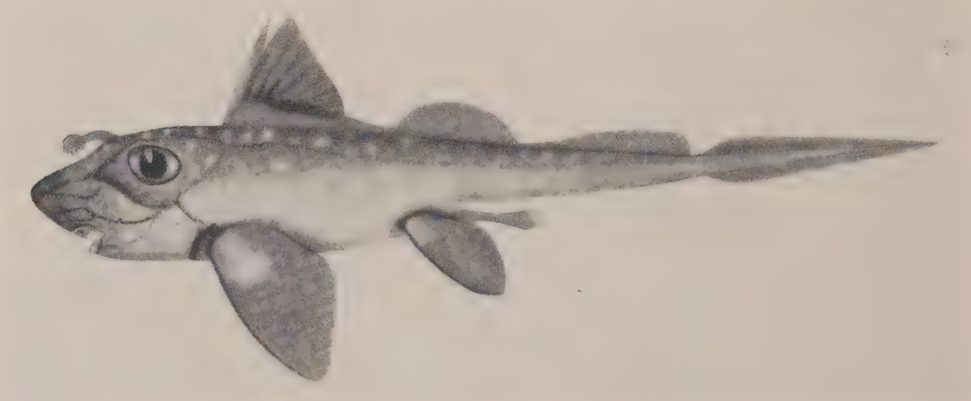

FIGURE 28. Rat-fish. *Hydrolagus colliei* (Lay and Bennett) 1839

Range southern California to northwestern Alaska.

Class III. **PISCES**

The fishes have many structural features which distinguish them from the cyclostomes and selachians. The skeleton is essentially bony, consisting of a vertebral column to which ribs are attached and a skull comprised of many distinct bones. The vertical and paired fins are supported by spines or jointed rays, or both; the paired fins are attached to well developed girdles; in the males the pelvic fins are not modified to form claspers. The mouth is supported by bony jaws, the upper of which is attached to the skull. The nostrils are paired and located on the dorsal surface of the head, each with one or two openings. The gill opening on each side of the body is covered with a bony operculum.

The class Pisces comprises three subclasses, the Palaeopterygii, the Neopterygii and the Crossopterygii. The last is not represented in these waters.

Subclass **PALAEOPTERYGII**

The members of this subclass have fins in which the supporting structures are generalized in character, hence the name *palaeo*—ancient and *pterygii*—fins. In the dorsal and anal fins the fin rays are more numerous than their basal supports.

Only one order of this subclass, the Chondrostei, is represented in the British Columbia fishes. It includes the family Acipenseridae, the sturgeons.

Family ACIPENSERIDAE Sturgeons

In the sturgeons the body is elongate with five widely separated rows of pointed bony shields; a pair of spiracles is present and the caudal fin is heterocercal. The head is covered with bony plates joined by sutures; the mouth is inferior and supported by jaws, which are toothless in the adults; the snout is much depressed and below it is a transverse row of four barbels.

The sturgeons are primitive fishes having certain structures superficially resembling those of sharks such as the inferior mouth supported by jaws, the spiracles and the heterocercal caudal fin, but they are not considered to have been derived directly from selachians.

Sturgeons are somewhat sluggish and live to a great extent on the bottom. Using their barbels to distinguish the presence of food they stir up the mud and gravel with their long snouts. They then suck up quantities of debris, separating out the edible materials such as small fishes, crustaceans, worms, etc., and expelling what is not desired. They occur in both fresh and salt water. The marine species enter rivers to spawn.

White sturgeon *Acipenser transmontanus* Richardson 1836

Body elongate, somewhat cylindrical. Head depressed; snout short, broad bluntly rounded, depressed; barbels, 4, in transverse row beneath snout, nearer tip of snout than mouth; mouth ventral, protrusible, sucker-like; teeth, absent. Fins: dorsal (1), 44 to 48; anal, 28 to 31; pelvic, abdominal; caudal, heterocercal. Bony shields: on body in 5 widely separated rows, each with sharp spine more or less developed; dorsal, 11 to 14; lateral, 38 to 48; ventrolateral, 9 to 12. Colour: uniform gray.

Length to 20 feet.

Distinguished by the short broad snout, the 4 barbels in a transverse row placed nearer the tip of the snout than the mouth, the 38 to 48 bony shields in the lateral series on each side of the body and the uniform gray coloration.

The white sturgeon was first recorded from British Columbia waters in 1866 by J. K. Lord as "*Accipenser transmontanus* of Richardson" (evidently a misprint for *Acipenser*). It is generally distributed along the coast and ascends various rivers from the Fraser to the Skeena, particularly at the time of the eulachon run in April. Spawning takes place in the spring and early summer. At one time large numbers entered the Fraser river proceeding to Pitt and Harrison lakes and some even to the north Thompson and upper Fraser rivers as far as Fraser and Stuart lakes where they were captured by means of set-lines, spears and gill-nets. The largest specimen known weighed approximately 1,800 pounds and was reported in the "British Columbian" of New Westminster, in the October 14 issue, 1897, as having been taken some years previously at Mission. The white sturgeon is undoubtedly a very slow-growing fish. Due to intensive fishing large specimens are now rarely taken and the species is in danger of extermination. Small individuals in considerable numbers are still caught in salmon gill-nets in the mouth of the Fraser river and a few in purse-seines on the west coast of Vancouver island and in the salmon-traps near Sooke. While information concerning the food is limited, this species is said to feed upon crustaceans and invertebrates in the sea and upon eulachons in the Fraser river. This is a valuable food fish, its flesh and roe commanding high market prices. The eggs, when cured in a special manner, constitute the commercial product "caviar."

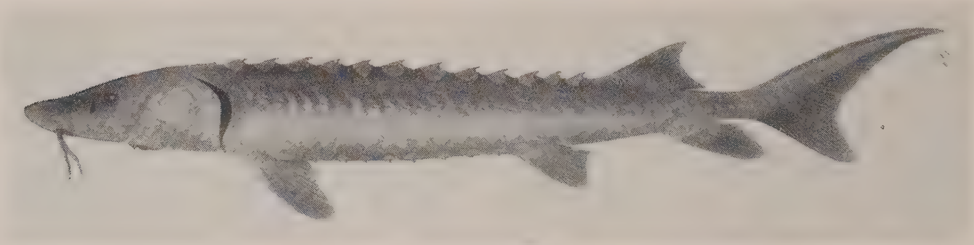

FIGURE 29. White sturgeon. *Acipenser transmontanus* Richardson 1836

Range northern California to northwestern Alaska.

Green sturgeon *Acipenser medirostris* Ayres 1854

Body elongate, somewhat cylindrical. Head depressed; snout elongate, narrow, blunt at tip, depressed; barbels, 4, in transverse row beneath snout, nearer mouth than tip of snout; mouth ventral, protrusible, sucker-like; teeth, absent. Fins: dorsal (1), 33 to 36; anal, 22 to 28; pelvic, abdominal; caudal, heterocercal. Bony shields: on body in 5 widely separated rows, each with sharp spine more or less developed; dorsal, 8 to 11; lateral, 23 to 30; ventrolateral, 7 to 10. Colour: olive green; olive stripe on median line of ventral surface, one on each side above ventrolateral plates, stripes ceasing opposite anus.

Length to 7 feet.

Distinguished by the elongate narrow snout, the 4 barbels in a transverse row placed nearer the mouth than the tip of the snout, the 23 to 30 bony shields in the lateral series on each side of the body and the olive green coloration on the body with the olive stripe on each side.

The green sturgeon was first taken in British Columbia waters August 30, 1908, near Victoria, and the specimen, 13½ inches in total length, is now in the Provincial Museum. It was recorded in 1923 by H. W. Fowler. The species is captured occasionally in the Fraser river area in the salmon gill-nets and has been reported off the west coast of Vancouver island by fishermen. Little is known of its habits and the life history is probably much the same as that of the white sturgeon. The largest specimen known from British Columbia waters weighed approximately 350 pounds. As a food fish it is considered very much inferior to the white sturgeon.

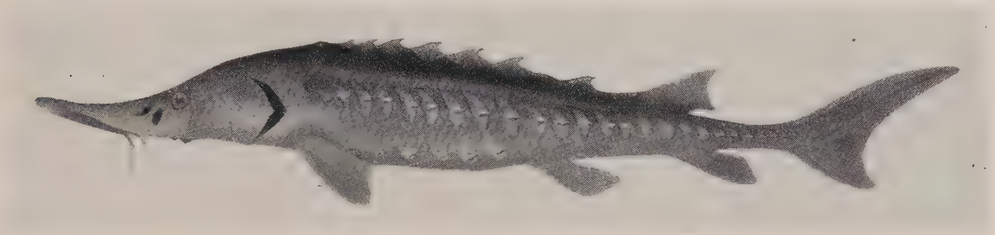

FIGURE 30. Green sturgeon. *Acipenser medirostris* Ayres 1854

Range southern California to northwestern Alaska.

Subclass **NEOPTERYGII**

The members of this subclass have fins which are specialized and characteristic of the modern fishes, hence the name, *neo*—new, pterygii—fins. In the dorsal and anal fins the fin rays are equal in number to their basal supports.

There are many orders in this subclass, of which eighteen are represented in British Columbia waters.

Order ISOSPONDYLI

In this order both the premaxillary and maxillary bones form the margin of the upper jaw. The fins have soft rays only. The pelvic fins are abdominal and an adipose fin is present in most species. The scales, when present, are cycloid.

The following suborders are represented in the fauna of the British Columbia coast: Clupeoidea, Salmonoidea, Opisthoproctoidea and Stomiatoidea.

Suborder CLUPEOIDEA

The fishes in this suborder lack an adipose fin and have no photophores or luminous organs on the body or the head.

One family, the Clupeidae, is represented in British Columbia waters.

Family CLUPEIDAE Herrings

In the herrings the body is elongate and compressed. The scales are large, cycloid and deciduous and may form a serrated edge along the midline of the ventral surface of the body. There is a single dorsal fin situated about the midlength of the body, not followed by an adipose fin, and a large fleshy appendage at the base of each pelvic fin. The lateral line is rarely developed to more than a few pores at the anterior end and for the purposes of this text is considered as absent.

The herring family includes the shads, the pilchards, the herrings and the anchovies. These fishes often occur in enormous schools and, in addition to being of great importance commercially, they are of incalculable value indirectly as a food supply for many commercially important predaceous fishes such as dog-fish, coho and spring salmon, cod and lingcod. Furthermore they are eaten extensively by marine waterfowl and seals.

Shad *Alosa sapidissima* (Wilson) 1812

Body elongate, deep, depth 3 to 3.5 in standard length, much compressed. Head compressed; mouth terminal, moderate; maxillary reaching to point below eye; teeth absent; striae on operculum coarse, radiating. Fins: dorsal (1), about 15; anal, about 21; pelvic, abdominal, each with fleshy appendage at base, origin slightly behind that of dorsal; caudal, furcate. Lateral line: absent. Scales: cycloid; in oblique rows above midline of body, about 60; on ventral surface, modified as strongly keeled scutes; on each side of tail, 2, greatly enlarged. Colour: metallic blue on dorsal surface; white on sides; silvery on ventral surface;

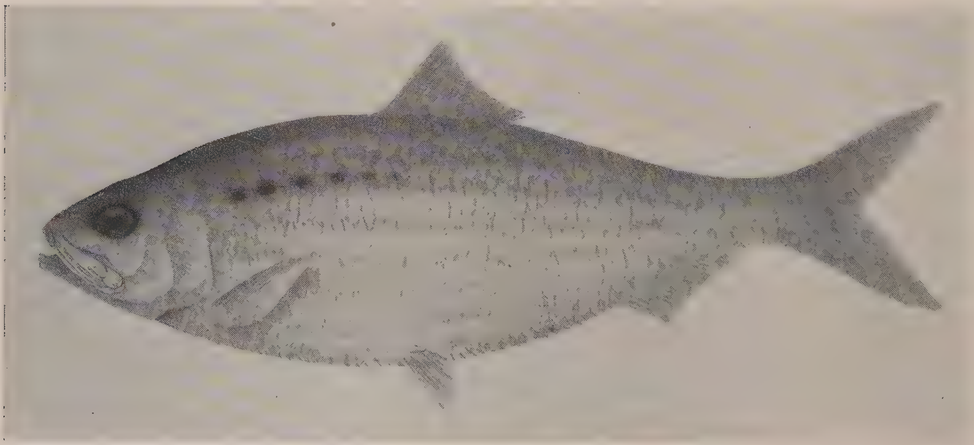

FIGURE 31. Shad. *Alosa sapidissima* (Wilson) 1812

black spots round, in row along each side of body, usually visible when scales in place, decreasing in size posteriorly, white on peritoneum.

Length to 2 feet 6 inches.

Distinguished by the coarse radiating striae on the operculum, the row of round black spots on the sides of the body decreasing in size posteriorly and the pair of specialized large scales on each side of the tail.

The shad was introduced in 1871 from the Atlantic coast into the Sacramento and Columbia rivers. It was first taken in British Columbia waters in 1876 near Vancouver island and recorded in 1891 by M. McDonald. By 1891 it had reached the Fraser and Stikine rivers, recorded in 1896 by H. M. Smith. It has established itself on the Pacific coast and has spread to southern California and northward to Cook inlet, Alaska. The shad has been caught in increasing numbers in the Fraser river in gill-nets and considerable quantities have been secured from time to time off the west coast of Vancouver island during the summer months in purse-seines. The shad is an ocean fish which in the spring ascends streams to spawn. A single female may deposit as many as 150,000 eggs, which are not adhesive and barely sink in fresh water. The young hatch in from 7 to 10 days and then go to sea. One fish taken in the Fraser river had reached an age of seven years. Weights up to 13½ pounds have been recorded. The adults are plankton-feeders for the most part. This fish is considered a delicacy when baked and the roe is highly prized.

Range southern California to northwestern Alaska.

Pilchard *Sardinops caerulea* (Girard) 1854

Body elongate, terete, depth about 5 in standard length. Head compressed; mouth terminal, moderate; maxillary reaching to point below eye; teeth, absent; striae on operculum fine, almost parallel, slightly curved. Fins: dorsal (1), about 19; anal, about 18; pelvic, abdominal, each with fleshy appendage at base, origin under or behind middle of base of dorsal fin; caudal, furcate. Lateral line: absent. Scales: cycloid; in oblique rows above midline of body, about 53; on ventral surface modified as weakly keeled scutes; on each side of tail, 2, greatly enlarged. Colour: dark blue on dorsal surface; silvery on ventral surface; black spots round, in one or more rows along each side of body, sometimes not visible when scales in place, uniform in size; usually small black dots in rows along dorsal surface; black on peritoneum.

Length to 16¼ inches.

Distinguished by the fine almost parallel striae on the operculum, the uniform round black spots along the sides of the body and the pair of specialized large scales on each side of the tail.

The pilchard was first taken in British Columbia waters in January, 1900, near Nanaimo. The two specimens obtained were deposited in the Provincial Museum at Victoria and were recorded in 1909 by F. Kermode as *Clupanodon caeruleus* Girard. The fish usually appear off the west coast of Vancouver island during early July in very large schools and disappear in late September or early

October, although some individuals may remain in the inlets throughout the winter. In certain years considerable numbers extend into the Queen Charlotte islands area and even into southeastern Alaska. Occasionally a few adults enter the strait of Georgia and Queen Charlotte strait. Early in 1940 and 1941 young pilchards in their second year appeared in large schools in the strait of Georgia and adjoining inlets, remaining throughout the following winter. Tagging experiments, in which small metal tags have been inserted in the body cavities of the pilchards, have shown that there is a definite north and south migration between British Columbia and California waters. Investigations have revealed a region of intensive spawning between point Conception and San Diego, California, and extending offshore for approximately 100 miles. The eggs, which are pelagic, are liberated chiefly in March, April and May in this area. Spawning has not been shown to take place off British Columbia. The food of the pilchard consists largely of minute plants and small crustaceans, collectively known as plankton.

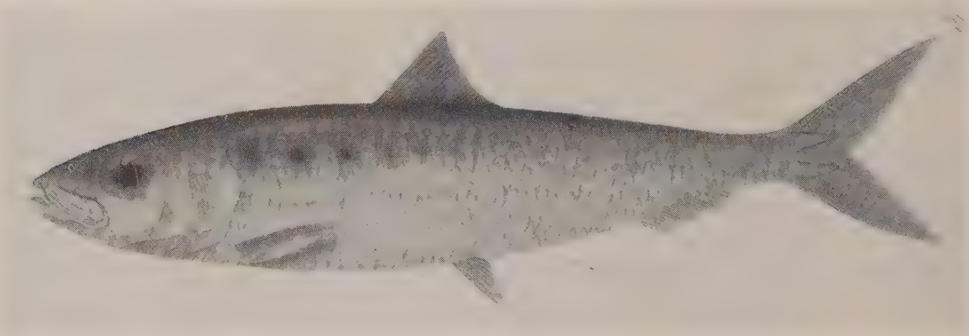

FIGURE 32. Pilchard. *Sardinops caerulea* (Girard) 1854

The pilchard is known as the sardine in California where the highest catch of 791,320 tons was taken in 1936-37. Large quantities are canned and marketed as the California sardine but a considerable tonnage is utilized for the production of oil and meal. In recent years rather extensive catches have been made off the Oregon and Washington coasts. In British Columbia, the fish is taken in purse-seines and is used largely for reduction purposes, but considerable quantities are canned. In 1929, 81,250 tons were reduced to oil and meal, 4,900 tons were canned and 150 tons were taken as bait. The total value of the pilchard products in that year was $2,200,000 and the investment in fishing and plant equipment amounted to over $3,000,000. In some years pilchards fail to appear off the British Columbia coast as in 1939, or come in small schools providing a catch of only a few thousand tons. Thus there is a considerable fluctuation in the extent of the fishery from year to year, probably associated with the coastal oceanographic conditions. Pilchard oil is used to a great extent in the manufacture of paints, soap, shortenings, and oleomargarine. The meal is used largely as feed for livestock and poultry.

Range southern California to southeastern Alaska.

Herring *Clupea pallasii* Valenciennes 1847

Body elongate, depth about 4 in standard length, moderately compressed. Head compressed; mouth terminal, moderate; lower jaw projecting; maxillary reaching to point below eye; teeth, absent from jaws, on vomer in form of ovate patch, on tongue small, weak; no striae on operculum. Fins: dorsal (1), 15 to 21; anal, 14 to 20; pelvic, abdominal, each with fleshy appendage at base, origin slightly behind that of dorsal; caudal, furcate. Lateral line: absent. Scales: cycloid; in oblique rows above midline of body, 51 to 54; on ventral surface modified as very weakly keeled scutes anterior to pelvic fins, more strongly keeled between pelvic fins and anus; on side of tail, not modified. Colour: bluish green on dorsal surface; silvery on ventral surface; black spots absent from sides of body; dusky on peritoneum.

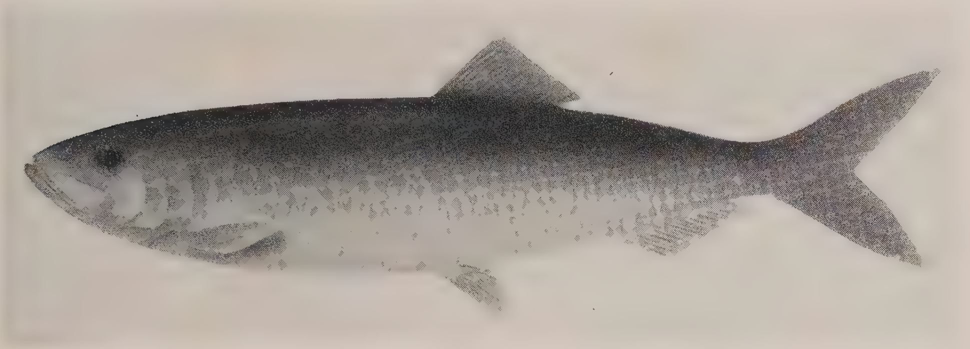

FIGURE 33. Herring. *Clupea pallasii* Valenciennes 1847

Length to 18 inches.

Distinguished from other members of the herring family by the absence of striae from the operculum, the absence of specialized scales from the sides of the tail and the absence of black spots from the sides of the body.

The herring was first recorded from British Columbia waters in 1866 without date or locality by J. K. Lord as *Malletta caerulia* Girard. Two skins collected by Mr. Lord were presented to the British Museum and in 1868 they were recorded by A. Günther as *Clupea mirabilis*. It is of interest to note that Archibald Menzies records in his journal the purchase of herring July 2, 1792, for the mess of the *Discovery*, from the Indians at Stuart island. The herring is very abundant throughout the coastal waters of British Columbia. It spawns in the winter and early spring months in the southern portion of the province, somewhat later in the northern portion, coming into the shore waters in large schools and depositing pale amber translucent adhesive eggs in enormous quantities on eel-grass, seaweed, wharf piles, etc. The eggs hatch in about two weeks, depending upon the water temperature. Maturity is reached in the second, third or fourth year and an age of eight or more years may be attained. Recent studies indicate that herring occur along the coast in a number of localized populations, and that a limited amount of intermingling takes place among these. Each population appears to have an annual migration between an inshore spawning area and an open-sea feeding ground. The food is composed predominantly of plankton crustaceans. Herring constitute one of the fundamental sources of food for almost the whole gamut of marine animals. The eggs are eaten by fishes and waterfowl, the larvae by countless invertebrates, including jelly-fish, comb-jellies and crustaceans, and the larger fish by sharks and fishes, waterfowl, seals and undoubtedly sea-lions. The wonder is that any individuals survive to maturity. Large quantities of herring are taken annually in purse-seines, gill-nets and traps for reduction to oil and meal, for canning, for smoking, for the fresh-fish market and for bait. In earlier years much of the catch was pickled by the "Scotch" cure and in subsequent years was drysalted for export to the Orient. In the 1942-43 season the total catch amounted to slightly over 79,000 tons, having a value of $8,223,754.00.

Range southern California to northwestern Alaska.

Anchovy *Engraulis mordax* Girard 1854

Body elongate, slender, more or less spindle-shaped, somewhat compressed. Head moderately compressed; mouth subterminal, very large; maxillary extending behind eye almost to gill opening; teeth, absent; eye large, near tip of snout; no striae on operculum. Fins: dorsal (1), 14 to 16; anal, 20 to 23; pelvic, abdominal, each with fleshy appendage at base, origin well in advance of that of dorsal; caudal; furcate. Lateral line: absent. Scales: cycloid; in oblique rows above midline of body, 41 to 50; on ventral surface, forming distinct serration.

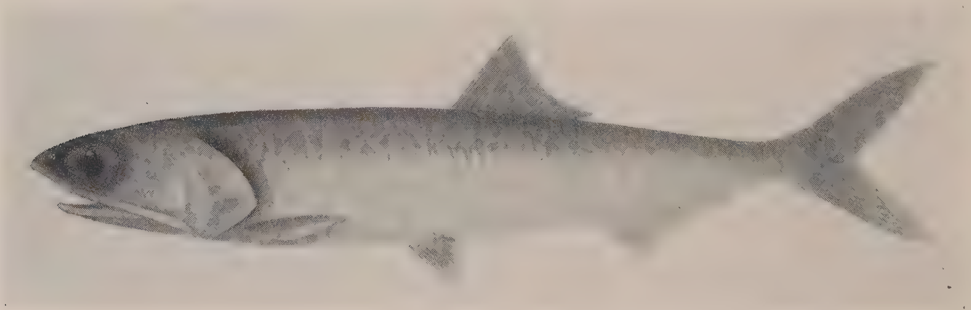

FIGURE 34. Anchovy. *Engraulis mordax* Girard 1854

Colour: metallic blue on dorsal surface; silvery on ventral surface; dusky on peritoneum.

Length to 7 inches.

Distinguished by the very large subterminal mouth and the eyes near the end of the snout.

The anchovy was first recorded from British Columbia waters in 1866 by J. K. Lord. In 1889 two specimens were obtained near Victoria and were recorded in 1891 by Ashdown Green as *Stolephorus ringens* in the *Proceedings of the Natural History Society of British Columbia.* The anchovy appears at times in rather large schools around both the west and east coasts of Vancouver island. In November, 1933, in Barkley sound, a single set of a purse-seine took about 200 tons. Large numbers appeared in the same area in 1939. During the early part of 1940 vast schools were observed in the strait of Georgia and as far north as Port Hardy. Spawning apparently occurs during July and August. The eggs are colourless or transparent, ellipsoidal and pelagic. Maturity is reached in the third year and an age of at least five years may be attained. The food consists largely of plankton crustaceans. Considerable quantities of anchovies are utilized for the production of oil and meal and small numbers are canned, pickled in brine and made into paste.

Range southern California to northern end of Vancouver island.

Suborder SALMONOIDEA

The fishes in this suborder have an adipose fin and a lateral line but no photophores or luminous organs on the body or the head. They inhabit the marine coastal waters, including brackish areas, and fresh water.

Two families are represented in the marine waters of British Columbia: Salmonidae and Osmeridae.

Family SALMONIDAE Salmons

In the salmons the body is moderately stout and covered with numerous small cycloid scales. The lateral line is well developed. The adipose fin is prominent and fleshy and there is a large fleshy appendage at the base of each pelvic fin. The colours are bright steely blue to green above and silvery below.

Included in this family are the Pacific salmons, the Atlantic salmon, the trouts and the chars, all of which are important commercial or sport fishes.

The Pacific salmons are placed in the genus *Oncorhynchus* and include five species, pink, coho, spring, chum and sockeye. They are characterized by having a comparatively large anal fin with 12 to 19 rays.

The salmons all have somewhat similar life histories. They spawn in fresh water from late summer to late autumn and die shortly afterwards. The eggs are deposited in gravel beds. The resulting young have large yolk-sacs and are known as *alevins*. They remain in the gravel beds until the yolk-sacs are absorbed and then emerge as *fry* in the late winter or early spring. The fry of some species proceed to sea almost immediately but in other species the fresh-water period may vary from a few weeks to one or more years. In the case of the sockeye, some populations do not go to sea and the fish are known as *kokanees*. The ocean life is one of feeding and rapid growth. During this time the colour is metallic blue on the back, with numerous black spots or specklings, and silvery on the sides and under surface. As the fish enter fresh water there is a tendency, in some species, for a red colour to appear on the body, especially in the males which at this time also develop elongate, hooked snouts.

The Pacific salmons support the most important commercial fishery of British Columbia, having a value of approximately $15,000,000 per annum.

The trouts and the Atlantic salmon are placed in the genus *Salmo*. They are readily distinguished from the Pacific salmons by the presence of 8 to 12 rays in the anal fin and in the fact that they may spawn more than once during their lives. They have teeth on the head and shaft of the vomer and are black spotted.

In connection with the life history of the Atlantic salmon a number of stages are recognized and given special names. Among these are : *parr*—a young fish with a series of vertical bars or *parr marks* on each side of the body; *smolt*—the young silvery fish on its migration seaward; *grilse*—a fish which has spent one winter in the sea and is returning to fresh water to spawn at 3 years of age; *kelt*—a fish which has spawned and is thin and in poor condition. All of these terms may be applied in the life history of the steelhead trout and some of them in the life histories of the Pacific salmons. With reference to the latter, the term *grilse* has been applied to those sockeye and spring individuals which are maturing at three years of age.

The chars comprise the genus *Salvelinus*. They have 8 to 12 rays in the anal fin as do the trouts but lack teeth on the shaft of the vomer. In coloration, they possess round red, pink, yellow or gray spots and bright colours on the margins of the lower fins. The chars are the most beautiful of the Salmonidae and rank high as game fishes.

The term char is used in Europe and it would be well to adopt the name in North America in order to distinguish these fishes from the members of the genus *Salmo*.

Pink salmon *Oncorhynchus gorbuscha* (Walbaum) 1792

Body elongate, somewhat compressed. Head conical; mouth terminal; teeth small, weak; branchiostegals, 9 to 15; rakers on first gill arch, 26 to 34. Fins: dorsal (1), 10 to 15; adipose, small, slender, fleshy; anal, 13 to 17; pelvic, abdominal, each with fleshy appendage at base; caudal, emarginate. Lateral line: slightly decurved, then straight. Scales: cycloid, small; in first row above lateral line, 170 to 229; on lateral line, 150 to 198. Pyloric caeca: 165 to 195. Colour: metallic blue on dorsal surface; silvery on sides; black blotches numerous, large, more or less oval on back and caudal fin; male at maturity, red to yellow on sides of body, black blotches obscure; female at maturity, olive-green on sides of body with dusky stripes. Flesh pink, paler in males with advancing maturity. Young without parr marks.

Length to 2 feet 6 inches.

Distinguished by the small scales, the 26 to 34 rakers on the first gill arch and the heavy oval black blotches on the caudal fin. The young are readily recognized by the absence of parr marks.

The pink salmon was first recorded from British Columbia waters in 1836 by Sir John Richardson on the basis of a male specimen taken in Observatory inlet which he described as the type of a new species, *Salmo Scouleri.* The skin was deposited in the British Museum. The pink salmon is common along the whole coast. Spawning takes place from late September to early November in practically all the streams. The males at this time develop in addition to their hooked snouts very large humps on their backs which led to their being called "hump-backs" in the early days of the fishery. Usually the fish remain near tidal waters but occasionally they travel for considerable distances, as for example, to Babine lake on the upper reaches of the Skeena river. The young go to sea as fry and reach maturity at two years of age. In most cases there is a large spawning run in one year and a small one in the next but occasionally the runs of successive years are approximately equal in size. In a few instances there are no runs in the second year, as for example, in Massett inlet and Naden harbour, which means the occurrence of a single population. Annual runs indicate two populations. In the southern portion of the province the large runs are in the odd years while in the northern portion the large runs are in the even years. The extent of the ocean movements is not yet known, but tagging experiments in relation to the Fraser river have shown that schools pass through both Juan de Fuca and Johnstone straits on their way to that river. The food consists chiefly of crustaceans. The weight at maturity is usually between 3 and 5 pounds but weights up to 10 pounds have been recorded. The pink salmon is taken commercially in purse-seines, gill-nets and traps. Quite frequently

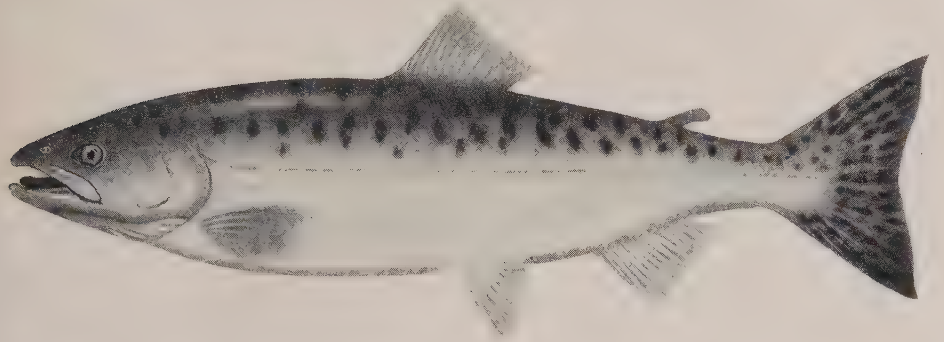

FIGURE 35. Pink salmon. *Oncorhynchus gorbuscha* (Walbaum) 1792

specimens are caught on trolling gear at the northern end of the Queen Charlotte islands. Practically the entire catch is canned.

Range northern California to northwestern Alaska.

Coho salmon *Oncorhynchus kisutch* (Walbaum) 1792

Body elongate, somewhat compressed; caudal peduncle stout. Head conical; mouth terminal; teeth firmly set, needle-like; branchiostegals, 11 to 15; rakers on first gill arch, 19 to 25, rough, widely spaced. Fins: dorsal (1), 9 to 13; adipose small, slender, fleshy; anal, 12 to 17; in young, up to 3 or 4 inches in length, first 2 or 3 rays usually longer and stouter than remainder; pelvic, abdominal, each with fleshy appendage at base; caudal, emarginate, outer rays somewhat limp. Lateral line: slightly decurved, then straight. Scales: cycloid; in first row above lateral line, 120 to 145; on lateral line, 121 to 136. Pyloric caeca: 45 to 80. Colour: metallic blue on dorsal surface; silvery on ventral surface and on caudal peduncle; black spots numerous, irregular, on back and usually on upper lobe of caudal fin. Flesh pink. Young with parr marks very strongly developed, long, heavy, extending almost completely across body; orange tinge on pectoral, pelvic and anal fins; white on anterior margin of anal fin.

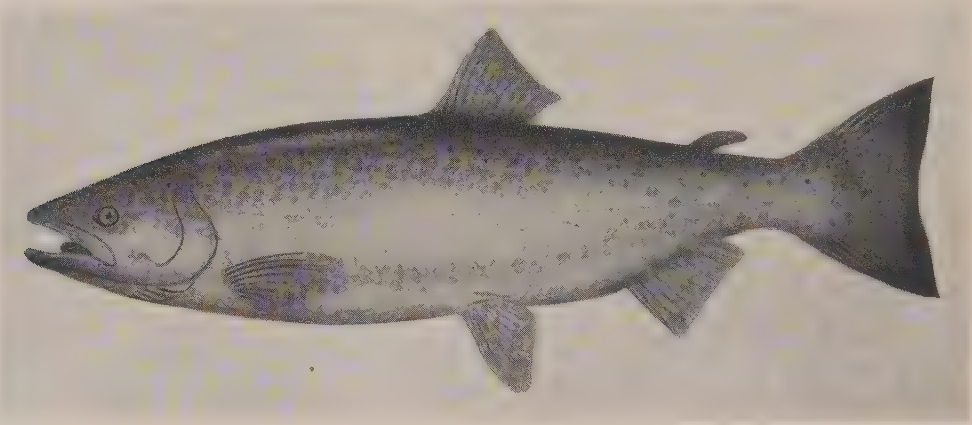

FIGURE 36. Coho salmon. *Oncorhynchus kisutch* (Walbaum) 1792

Length to 3 feet.

Distinguished by the black spotting confined to the back and the upper lobe of the caudal fin, the needle-like firmly set teeth, the 19 to 25 rough widely spaced rakers on the first gill arch and the small number of pyloric caeca. The young are readily recognized by the elongate rays in the anal fin, the orange tinge on the lower fins and the elongate parr marks.

The coho salmon was first recorded from British Columbia waters in 1881 from the Fraser river by D. S. Jordan and P. L. Jouy and the specimen is in the

United States National Museum. The species is common throughout the coastal waters. It enters innumerable streams and may spawn at a short distance from the sea or may proceed to the upper tributaries of the larger rivers. The great majority of the young remain one year in fresh water but a few migrate to sea in the first and third years. Growth is rapid and maturity is usually attained at the end of the third summer, occasionally at the end of the second or rarely the fourth. In certain areas young cohos at the beginning of the third year have deep blue backs and bright red flesh and are commonly referred to as blue-back salmon. The food of the coho salmon consists largely of herring, pilchards and sand-lance as well as other small fishes, squid and an assortment of crustaceans. The average weight at maturity is from 6 to 12 pounds but weights up to 26½ pounds have been recorded. The coho salmon is captured by troll, purse-seine, gill-net and trap. The bulk of the catch is canned and marketed either as coho or blue-back salmon. However some of the fish are sold as fresh salmon. This species also provides a considerable amount of sport fishing, in trolling and fly-casting. The term silver salmon is applied to the coho salmon in American waters.

Range northern California to northwestern Alaska.

Spring salmon *Oncorhynchus tshawytscha* (Walbaum) 1792

Body elongate, somewhat compressed; caudal peduncle stout. Head conical; mouth terminal; teeth not rigid, conical, moderately sharp; branchiostegals, 13 to 19; rakers on first gill arch, 20 to 28. Fins: dorsal (1), 10 to 14; adipose, relatively small, stout, fleshy; anal, 15 to 19; pelvic, abdominal, each with fleshy appendage at base; caudal, emarginate, outer rays rigid. Lateral line: slightly decurved, then straight. Scales: cycloid; in first row above lateral line, 140 to 153; on lateral line, 131 to 151. Pyloric caeca, 140 to 185. Colour: greenish

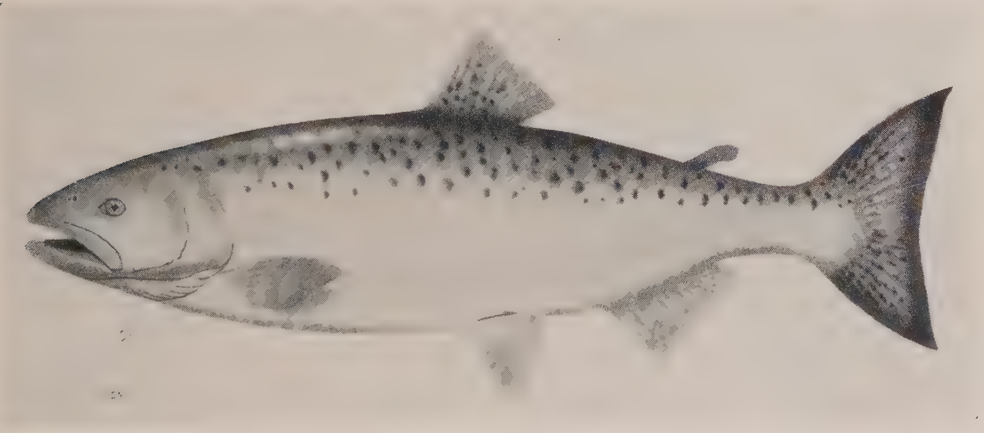

FIGURE 37. Spring salmon. *Oncorhynchus tshawytscha* (Walbaum) 1792

blue to black on dorsal surface, frequently with faint reddish to rusty hue; black spots numerous, irregular, on back, dorsal fin and both lobes of caudal fin. Flesh red or white, occasionally pink. Young with parr marks very strongly developed, long, heavy, extending almost completely across sides of body.

Length to 4 feet 10 inches.

Distinguished by the black spotting on the back, dorsal fin and both lobes of the caudal fin, the large number of pyloric caeca and the loose conical teeth. The young are readily recognized by the strongly developed parr marks.

The spring salmon was first recorded from British Columbia waters in 1866, presumably from the Chilliwack (Chilukweyuk) river, by J. K. Lord, as *Salmo quinnat*. It is common along the coast of the province. The spawning run in the late spring and early summer is chiefly to the larger rivers. The young may go to sea during the first year or remain at least a year in the streams. Growth is rapid in the sea and maturity is attained in the third to eighth year but usually in the fourth or fifth. Early maturing males are frequently called "Jacks". Tagging operations have shown that long distances may be travelled, as for example, from Alaska to the Columbia river, from Hippa island to Marshfield, Oregon, and from Barkley sound to the Sacramento river, California. The food consists chiefly of herring and sand-lance, with small quantities of other small fishes, crustaceans and squids. During 1940 young pilchards were very abundant in the vicinity of Barkley sound and in the southern portion of the strait of Georgia and comprised about 27% of the food of the spring salmon in the former area and about 77% in the latter. The weights at maturity usually range from 10 to 50 pounds but weights up to 108 pounds have been recorded. Commercial fishing is by troll, purse-seine, gill-net and trap and the catch is canned, frozen, smoked and drysalted. Large quantities are sold as fresh spring salmon. In many areas the spring salmon provides excellent sport fishing, as for example, off Campbell and Oyster rivers and off Comox where large individuals are caught by rod and line and called tyee salmon. In American waters various names are applied to this species, such as king, chinook, quinnat, etc.

Range southern California to northwestern Alaska.

Chum salmon *Oncorhynchus keta* (Walbaum) 1792

Body elongate, somewhat compressed; caudal peduncle slender. Head conical; mouth terminal; teeth conical, strongly developed, becoming fang-like in mature males; branchiostegals, 10 to 16; rakers on first gill arch, 19 to 26, short, stout, smooth, widely spaced. Fins: dorsal (1), 10 to 13; adipose, small, slender, fleshy; anal, 13 to 17; pelvic, abdominal, each with fleshy appendage at base; caudal, emarginate. Lateral line: slightly decurved, then straight. Scales: cycloid; in first row above lateral line, 130 to 153; on lateral line, 126 to 151. Pyloric caeca: 140 to 185. Colour: metallic blue on dorsal surface with occasional black specklings; no black spots; black tinge on tips of pectoral, anal and caudal fins, especially in male; in maturing adults in fresh water irregular reddish to dusky streaks or bars across sides of body, white on tips of pelvic and anal fins. Flesh pale pink. Young with parr marks as slender bars, scarcely extending below lateral line and green iridescence on back.

Length to 3 feet 2 inches.

Distinguished by the absence of large black spots from the body and the fins, the slender caudal peduncle, the tips of all fins except dorsal tinged with black, the series of dusky streaks or bars across the sides of the body in mature adults in fresh water, the 20 to 26 smooth widely spaced rakers on the first gill arch and the large number of pyloric caeca. The young are readily recognized by the slender parr marks, scarcely extending below the lateral line, and the green iridescence on the back.

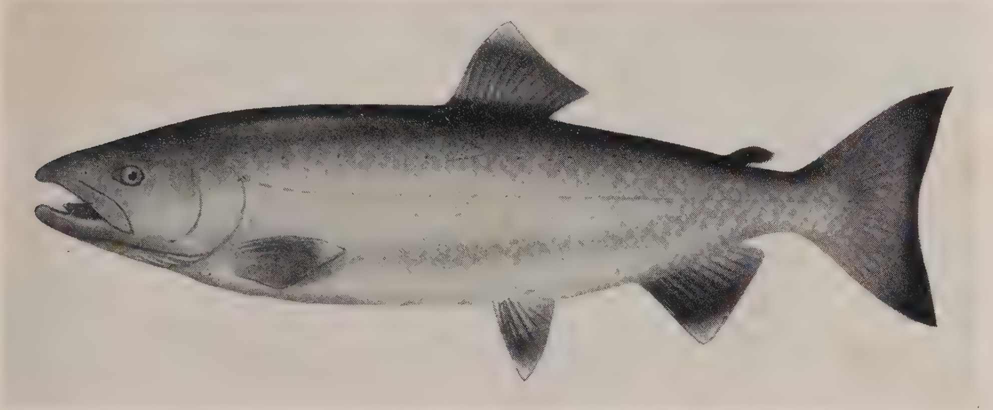

FIGURE 38. Chum salmon. *Oncorhynchus keta* (Walbaum) 1792

The chum salmon was first recorded from British Columbia waters in 1881 from the Fraser river by D. S. Jordan and P. L. Jouy and the specimen is now in the United States National Museum. The species is abundant along the whole coast and of the Pacific salmons it is the latest to appear during the fall in spawning schools. It ascends practically all streams, spawning usually at no great distance from the salt water but in some cases travelling long distances upstream. The young go to sea during the following spring and usually reach maturity in the fourth year. Little is known of the ocean migration routes but tagging has shown that many chum salmon enter the straight of Georgia through Johnstone strait as well as through Juan de Fuca strait. The food consists chiefly of crustaceans. The weight at maturity is usually from 8 to 18 pounds but weights up to 30 pounds have been recorded. Fishing is by purse-seine, gill-nets and traps and the catch is chiefly canned, drysalted and frozen. The chum salmon was formerly known as the dog salmon.

Range northern California to northwestern Alaska.

Sockeye salmon *Oncorhynchus nerka* (Walbaum) 1792

Body elongate, somewhat compressed. Head conical; mouth terminal; teeth small, weak; branchiostegals, 11 to 15; rakers on first gill arch, 30 to 39, long, slender, rough, closely set. Fins: dorsal (1), 11 to 16; adipose, small, slender, fleshy; anal, 13 to 17; pelvic, abdominal, each with fleshy appendage at base; caudal, emarginate. Lateral line: slightly decurved, then straight. Scales: cycloid; in first row above lateral line, 125 to 143; on lateral line, 125 to 139. Pyloric caeca: 66 to 92. Colour: greenish blue on dorsal surface with fine black specklings; no black spots; metallic green on head; brilliant red on body of mature male; dark red with green and yellow blotches on body of mature female. Flesh, rich red. Young with parr marks oval, scarcely extending below each lateral line.

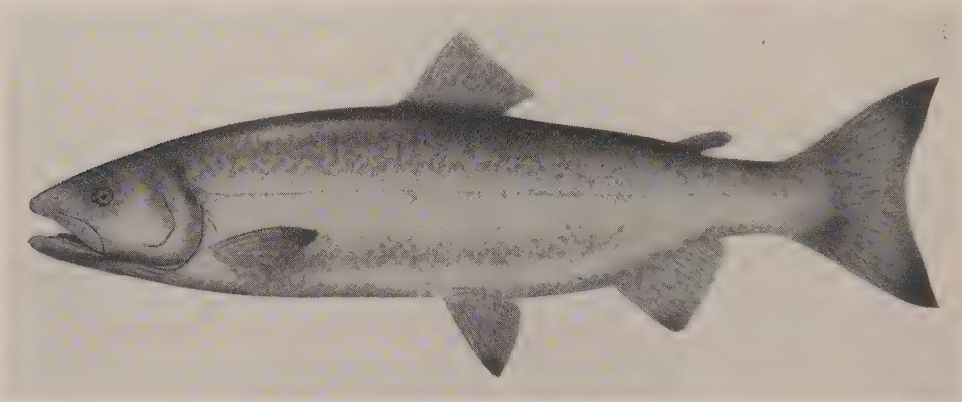

FIGURE 39. Sockeye salmon. *Oncorhynchus nerka* (Walbaum) 1792

Length to 2 feet 9 inches.

Distinguished by the 30 to 39 long slender closely-set rakers on the first gill arch, the small number of pyloric caeca and the fine black specklings on the back. The young are readily recognized by the oval parr marks scarcely extending below each lateral line.

The sockeye salmon was first recorded from British Columbia waters in 1866 without date or locality of capture by J. K. Lord as *Salmo paucidens* of Richardson. He also referred to the same species in spawning colours as *Salmo lycaodon*. The species is abundant along the whole coast. For the most part the spawning migration takes place during the summer months, the adults entering those rivers fed by lakes, which they pass through, and spawn in the streams tributary thereto. Upon hatching in the following spring the young descend to the lakes where they spend usually one, frequently two, occasionally three years and then migrate to the ocean, usually during March and April. Some individuals pass directly to the sea as fry. In many localities the sockeye salmon has become "lake-locked", completing its life cycle in fresh water. It is then known as the kokanee, kickaninny, Kennerly's salmon or little red-fish and sometimes locally as "silver trout." The sockeye salmon usually matures at four and five years of age but a few mature at three and six years and fewer still at seven and eight years. Information concerning the movements in the ocean is meagre. Tagging operations in 1925 at Haystack island, off Portland canal, showed a main migration to the Nass river but also movements of a few individuals as far north as Ernest sound, Alaska, and as far south as Union passage (Grenville channel). Tagging, also in 1925, at Seymour narrows, showed a migration to the Fraser river, indicating a definite movement of sockeye salmon through Johnstone strait in addition to the main migration through Juan de Fuca strait. The food consists chiefly of crustaceans, of which euphausids form a high percentage. The weight at maturity is usually between 5 and 7 pounds but weights up to 15½ pounds have been recorded. The sockeye salmon is taken chiefly in gill-nets at the mouths of rivers, to some extent in purse-seines and in traps at the south end of Vancouver island. Occasionally individuals are caught with trolling gear. It is the most prized of the Pacific salmons for canning purposes because of the deep red colour and the flavour of its flesh. This fish is known as the red in Alaska and the blue-back on the Columbia river.

Range southern Oregon to northwestern Alaska.

Coastal cut-throat trout *Salmo clarkii clarkii* Richardson 1836

Body elongate, rounded, slightly compressed; caudal peduncle stout. Head relatively long; mouth terminal; maxillary extending to point well behind posterior margin of eye; teeth, on head and shaft of vomer and on back of tongue, well developed. Fins: dorsal (1), 8 to 11; adipose, small, slender, fleshy; anal, 10 usually, 9 to 11 occasionally; pelvic, abdominal, each with fleshy appendage

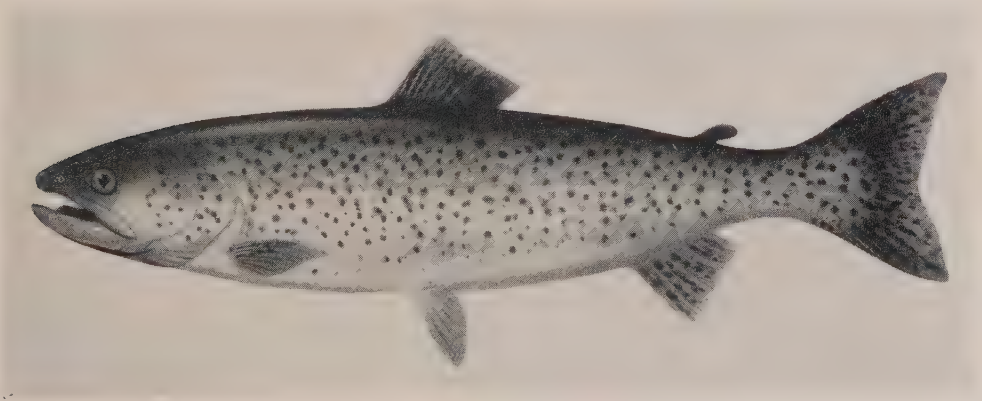

FIGURE 40. Coastal cut-throat trout. *Salmo clarkii clarkii* Richardson 1836

at base; caudal, truncate. Lateral line: slightly decurved, then straight. Scales: cycloid; in oblique rows above lateral line, 120 to 200. Colour: greenish blue on dorsal surface; silvery on sides; black spots on body, head and vertical fins, numerous, heavy, each without halo; bright red dash below lower jaw on each side.

Length to 2 feet 6 inches.

Distinguished by the teeth on the back of the tongue, the bright red dash on the under side of the lower jaw on each side (hence the name cut-throat), the long head and the more or less rounded body.

The coastal cut-throat trout was first recorded from British Columbia waters in 1866, without date or locality of capture, by J. K. Lord as *Fario stellatus*. This trout is common along the whole coast in the sea as well as in adjacent streams and lakes. A subspecies, the Yellowstone cut-throat, *Salmo clarkii lewisii*, occurs in the southeastern portion of the province and has been distributed widely in fish cultural operations, even to the river systems with immediate access to the sea. The coastal cut-throat trout spawns usually from February to May in small streams, although in the Cowichan river system it has been found to spawn as early as December. The young may descend to the sea in their second or third year, taking up an estuarine or marine life for one or more years. These estuarine fish frequently enter the lower reaches of streams in the spring and feed upon young salmon migrating seaward. Apparently they return to the sea and re-enter the streams in the autumn and winter on a spawning migration. Some individuals remain in fresh water throughout their lives. The food in the marine habitat consists of small fishes such as sand-lance, salmonoids, rock-fishes, sea-perches, sculpins and flat-fishes as well as crustaceans; while in fresh water it consists of insects, both aquatic and terrestrial, freshwater shrimps and small fishes. Weights up to 17 pounds have been recorded from inland lakes. The cut-throat is much prized as a game fish, both in fresh and salt water. Small specimens caught in salt water are frequently called "sea-trout."

Range northern California to southeastern Alaska.

Brown trout *Salmo trutta* Linnaeus 1758

Body elongate, little compressed; caudal peduncle stout. Head relatively short; mouth terminal; maxillary reaching to point behind posterior margin of eye; teeth on head and shaft of vomer well developed, on back of tongue, none. Fins: dorsal (1), about 11; adipose, small, slender, fleshy; anal, about 9; pelvic, abdominal, each with fleshy appendage at base; caudal, truncate. Lateral line: slightly decurved, then straight. Scales: cycloid; in oblique rows above lateral line, 116 to 136. Colour: brown to golden brown on dorsal surface; silvery on sides; small black spots and crosses on back and top of head; black spots below lateral line and forward, profuse, large, each surrounded by halo of pink or red; no red dash below lower jaw.

Length to 3 feet 3 inches.

Distinguished by the black spots below the lateral line surrounded by halos of pink or red, together with the absence of teeth from the back of the tongue.

The brown trout was introduced into British Columbia in 1932, 1933 and 1934 from Wisconsin and Montana as eggs purchased by the Dominion Department of Fisheries. The eggs were placed in hatcheries at Cowichan lake and Qualicum beach and later the young were liberated as fry, fingerlings and yearlings into the Cowichan and Little Qualicum rivers on Vancouver island, in an attempt to provide a fish for summer angling. A considerable number of individuals have been caught in salt water at the mouth of the Little Qualicum river as well as in the stream itself. The brown trout is also established in the upper portion of the Cowichan river, where it reaches a weight of 5 pounds or more. Elsewhere in the river system the species is scarce and no sea-going tendencies have been observed. Fish in the upper part of the river do not appear to migrate extensively. Spawning takes place mainly in November and December in small streams tributary to the Little Qualicum and Cowichan rivers, the fish maturing at three or four years of age. The fry emerge in the following spring. Many of the young fish remain for one or two years in the spawning streams. Generally speaking, the species is not numerous in comparison with the native trouts although differences in habits may lead to its predominance in one or two restricted localities in summer. The incidence of the brown trout in anglers' catches is much lower than that of the native species in relation to numbers present, probably due to greater wariness or tendency to feed freely only at certain times of the day. The food is similar to that of the coastal cut-throat trout. The maximum weight recorded for the species is about 30 pounds. The trout of Loch Leven, Scotland, have been termed Loch Leven trout and the scientific name, *Salmo levenensis*, has been applied. However, a detailed study

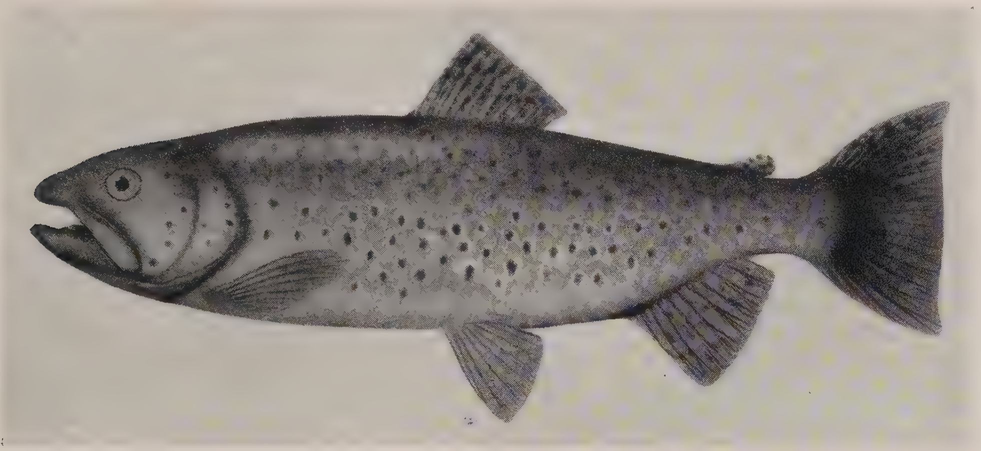

FIGURE 41. Brown trout. *Salmo trutta* Linnaeus 1758

of it and other European geographically isolated forms has shown them to be indistinguishable from the brown trout in any significant characters.

Range California to Vancouver island.

Steelhead trout *Salmo gairdnerii gairdnerii* Richardson 1836

Body elongate, rather deep, compressed; caudal peduncle stout. Head relatively short; mouth terminal; maxillary extending to point below, or slightly behind, posterior margin of eye; teeth on head and shaft of vomer poorly developed, on back of tongue, none. Fins: dorsal (1), 11 or 12; adipose small, slender, fleshy; anal, 10 or 11 usually, 9 or 12 occasionally; pelvic, abdominal, each with fleshy appendage at base; caudal, truncate. Lateral line: slightly decurved, then straight. Scales: cycloid; in oblique rows above lateral line, 115 to 159. Colour: metallic blue on dorsal surface; silvery on sides; black spots on back, on dorsal, adipose and caudal fins, each without halo; continuous deep pink to red band along each side of body, especially in males, at spawning time; no red dash below lower jaw.

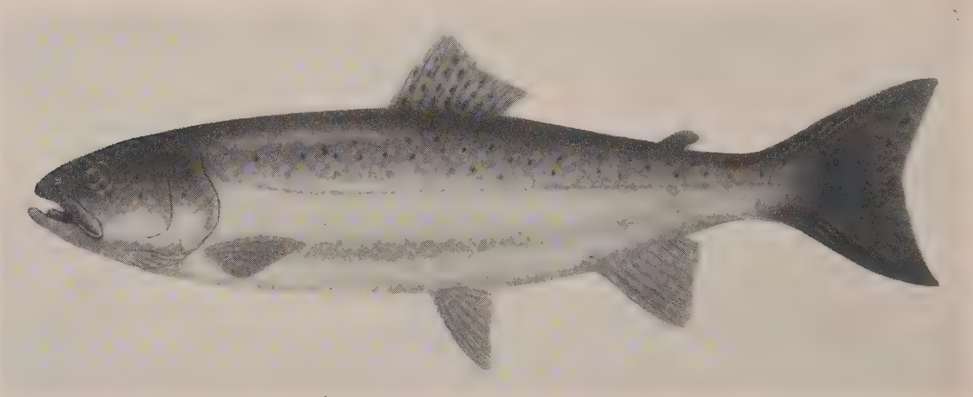

FIGURE 42. Steelhead trout. *Salmo gairdnerii gairdnerii* Richardson 1836

Length to 3 feet 9 inches.

Distinguished by the absence of a bright red dash from the under side of the lower jaw, the short head, the absence of teeth from the back of the tongue and the compressed body.

The steelhead trout was first recorded from British Columbia waters in 1866, without date of capture or locality, by J. K. Lord as *Salmo Gairdneri*. This trout is common along the whole coast of the province and is, in a sense, the Pacific representative of the Atlantic salmon. It spends a considerable part of its life in the sea entering the rivers in the third, fourth or fifth years, after two or more summers in salt water, for the first spawning. It may enter fresh water in almost any month of the year although it does not spawn until the winter or spring. Like the Atlantic salmon it may spawn more than once and return to the sea after each spawning. The young go to sea after spending one or two years in fresh water and return as mature steelheads to spawn in fresh water. Some individuals remain in fresh water all their lives and are then known as "rainbows." The term rainbow trout is derived from the presence of a purplish coloured band along each side of the body. In the interior of the province, especially in the southern portion, there is a subspecies of the steelhead trout known as the Kamloops trout, *Salmo gairdnerii kamloops*, which inhabits the lakes, never goes to sea, and spawns during the spring months in the tributary streams. The Kamloops trout has been introduced widely into coastal streams and lakes. The steelhead trout enters to a considerable extent into the commercial fishery being taken chiefly in gill-nets in the mouths of the larger rivers. It is also a splendid game fish and is most frequently secured in and off the mouths of numerous streams along the coast. The food in the sea consists of herring and other fishes. Individuals have been taken weighing as much as 36 pounds.

Range southern California to southeastern Alaska.

Atlantic salmon *Salmo salar* Linnaeus 1758

Body elongate, moderately compressed; caudal peduncle slender. Head relatively short; mouth terminal; maxillary reaching to point slightly behind posterior margin of eye; teeth on head and shaft of vomer, short, little developed, on back of tongue, none. Fins: dorsal (1), 11 or 12; adipose, small, slender, fleshy; anal, 9 usually, 8 or 10 occasionally; pelvic, abdominal, each with fleshy appendage at base; caudal, more or less furcate in young, becoming more truncate with age. Lateral line: slightly decurved, then straight. Scales: cycloid; in oblique rows above lateral line, about 120. Colour: light brown on dorsal surface; silvery on sides; black spots on body numerous, often X-shaped, sometimes on dorsal, adipose and anal fins; no pink or red band along side of body; no red dash below lower jaw.

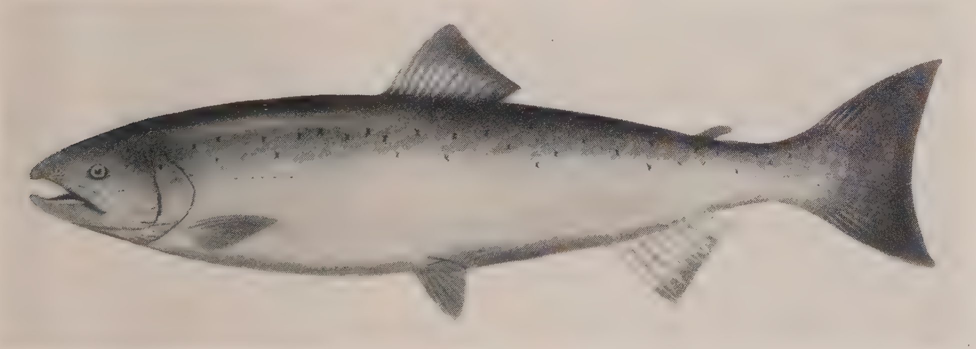

FIGURE 43. Atlantic salmon. *Salmo salar* Linnaeus 1758

Length to 4 feet.

Distinguished by the brownish coloration on the back, the X-shaped black spots on the body and the slender caudal peduncle.

The Atlantic salmon was introduced into British Columbia in 1905, through the transfer of eggs from the Canadian Atlantic coast to the Cowichan lake hatchery by the Dominion Department of Fisheries. Further introductions were made over a considerable period of years. The resulting fingerlings and yearlings were liberated in the Cowichan and many other river systems. It was hoped that this much-prized fish might become established and provide an attractive angling fishery. However, the liberations of young fish did not produce the expected results, although a few individuals were caught in the Cowichan river by anglers. In 1933 and 1934, shipments of Atlantic salmon eggs were secured from Scotland but these introductions were even less successful in that no reports of captures were obtained. On the Atlantic coast the Atlantic salmon spawns in the upper reaches of streams in autumn, the eggs hatching in the following spring. The young remain in the streams for one or two years, then migrate to sea and mature at three, four, or five years of age. Like the steelhead and cut-throat trouts they do not die after the first spawning but return to the sea and may spawn a second or third time. Weights up to 100 pounds and slightly over have been reported in European countries. Since the name Atlantic salmon is rather confusing when this fish is grouped with the other trouts it might be well to point out that trouts were once supposed to be confined to fresh water while the salmon spent part of its life in salt water. (The "salmon" being *Salmo salar*.) Later it was found that the brown trout also went to sea. When European settlers came to the Pacific coast they applied the term *salmon* to the Pacific species—which are now placed in the genus *Oncorhynchus*.

Range northern California to Vancouver Island.

Dolly Varden *Salvelinus malma* (Walbaum) 1792

Body elongate, somewhat rounded, moderately compressed. Head large, elongate; mouth terminal, large; maxillary reaching to point behind posterior margin of eye; teeth on head of vomer only; eye large. Fins: dorsal (1), 10 or 11; adipose small, slender, fleshy; anal, about 9; pelvic, abdominal, each with fleshy appendage at base; caudal, truncate. Lateral line: slightly decurved, then straight. Scales: cycloid, small; in oblique rows above lateral line, 190 to 250. Colour: olive green to brown on dorsal surface with pale yellow spots; red spots on sides numerous, small; vermiculations, absent; sea-run individuals silvery.

Length to 3 feet.

Distinguished by the pale yellow spots on the back and the red spots on the sides of the body, the absence of vermiculations from the back and the presence of teeth on the head of the vomer only.

The Dolly Varden was first recorded from British Columbia waters in 1866 by J. K. Lord as *Salmo spectabilis* and as *Fario Lordii* n.s. The first definite locality record is that of a specimen taken in August, 1881, near Port Simpson by Capt. H. E. Nichols and recorded in the same year by T. H. Bean as *Salvelinus malma*. The Dolly Varden is widely distributed in British Columbia, occurring in both fresh and salt water, with its marine abundance to the northward. Spawning occurs in the autumn months in streams. In many areas regular seaward migrations take place in the spring and upstream migrations in the fall. The food consists of insects, crustaceans and fishes, including sticklebacks, herring, young salmon and salmon eggs. It is the native red-spotted char of the province, varying in size and coloration according to the water inhabited. While not generally regarded as highly as the steelhead and cut-throat trouts, it nevertheless ranks as a splendid sport fish. Weights up to 20 pounds have been recorded.

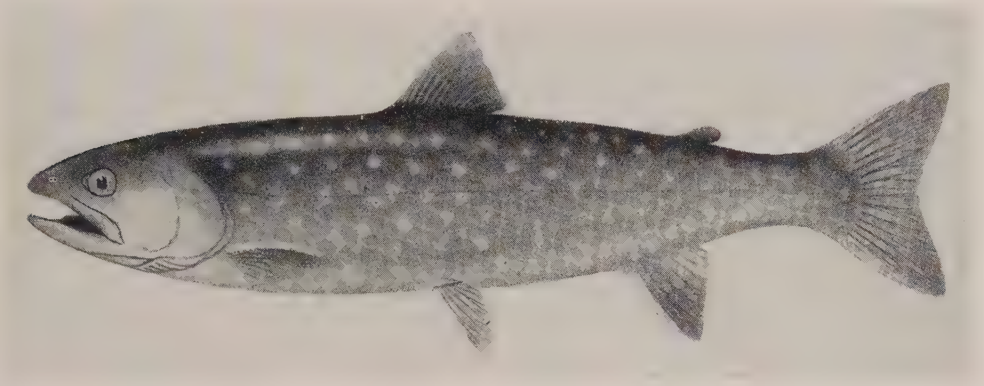

FIGURE 44. Dolly Varden. *Salvelinus malma* (Walbaum) 1792

Range northern California to northwestern Alaska.

Speckled char *Salvelinus fontinalis* (Mitchill) 1815

Body elongate, somewhat moderately compressed. Head large, elongate; mouth terminal, large; maxillary reaching to point behind posterior margin of eye; teeth on head of vomer only; eye large. Fins: dorsal (1), about 10; adipose small, slender, fleshy; anal, about 9; pelvic, abdominal, each with fleshy appendage at base; caudal, truncate. Lateral line: slightly decurved, then straight. Scales: cycloid; in oblique rows above lateral line, about 230. Colour: dark olive green on dorsal surface, without spots; red spots surrounded by blue borders on sides; darker green vermiculations on back and dorsal fin. Sea-run individuals silvery.

Length to 2 feet 10 inches.

Distinguished by the red spots on the sides of the body, the dark olive green vermiculations on the back and the dorsal fin and the teeth on the head of the vomer only.

The speckled char was first introduced into British Columbia in 1908 as eggs from the province of Quebec. The young from this and subsequent introductions were distributed into various lakes and streams of British Columbia including some on Vancouver island. There is no record as yet of a specimen having been taken in the sea on the British Columbia coast but since the species is sea-running on the Atlantic coast there is reason to expect that it may have a similar habit on the Pacific. The speckled char is the eastern cousin of the Dolly Varden, which it closely resembles in life history. Spawning occurs in the autumn months. It feeds largely upon insects, crustaceans and to a considerable extent upon small fishes, if available. This char is one of the most beautiful of sport fishes and in eastern waters it is known as the eastern brook trout and is very highly regarded. Whether it will become a popular game fish in British Columbia remains to be seen. In eastern waters the record weight is 14½ pounds, while in British Columbia a weight of 9 pounds has been reported.

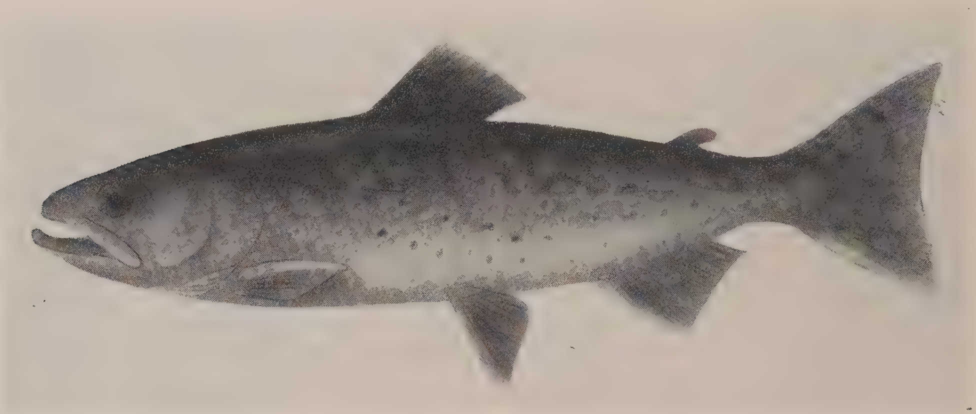

FIGURE 45. Speckled char. *Salvelinus fontinalis* (Mitchill) 1815

Range northern California to Vancouver island.

Family OSMERIDAE Smelts

In the smelts the body is slender and covered with numerous small cycloid scales. A lateral line is well developed. An adipose fin is present. There is no fleshy appendage at the base of either pelvic fin. The colours are olivaceous blue to brown above and silvery below.

The members of this family are essentially marine, although some species spend all or a considerable portion of their lives in fresh water. The males do not attain as great a size as the females and frequently have longer paired fins. They may develop enlarged scales along the lateral line or tubercles on the head, scales and fins at sexual maturity. Spawning takes place on sandy sea beaches or in fresh water. Smelts are all relatively small in size and generally occur in large schools. Most of the species are very rich in oil and are excellent food fishes.

Capelin *Mallotus catervarius* (Pennant) 1784

Body elongate, slender, appearing angular in breeding males because of enlarged scales on the lateral line. Head elongate; snout pointed; mouth terminal, large; maxillary extending to point below middle of eye; teeth small, on jaws, vomer, palatines and tongue; opercle roughened. Fins: dorsal (1), 12 or 13; adipose large, base about half that of dorsal; anal, 17 to 20, large, bases and distal ends of first 10 to 12 rays much thickened in breeding males; pelvic, abdominal; pectoral, 16 to 19, shorter than head; caudal, furcate. Lateral line: almost straight. Scales: cycloid, small; on lateral line, 175 to 209; in two villous bands along each side of body in breeding male. Colour: olive green on dorsal surface, merging into silvery on sides and ventral surface; silvery with numerous black dots on opercles.

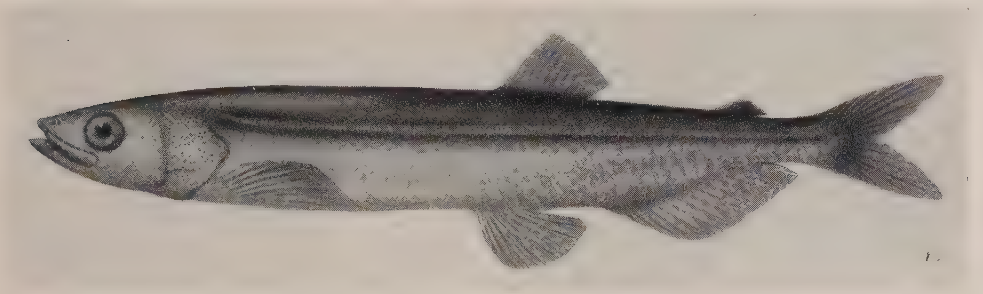

FIGURE 46. Capelin. *Mallotus catervarius* (Pennant) 1784

Length to 6 inches.

Distinguished by the very small scales, the large adipose fin, the rough opercles and the villous bands of scales on each side of the body in the breeding male.

The capelin was first recorded from British Columbia waters in 1891 by Ashdown Green as *Mallotus villosus* on the basis of a bucketful of these fish which he had seen for sale two years previously at Victoria. The capelin is common along the coast of British Columbia. It is an Arctic species apparently reaching its southern distribution in Juan de Fuca strait. In the strait of Georgia spawning occurs at night in late September and October on sandy beaches near the water's edge at maximum high tide. The eggs are adhesive and are attached to coarse sand grains. Through the wave action of the ebbing tide the eggs are buried to a depth as great as 6 inches. A single female deposits between 3,000 and 6,000 eggs which hatch in approximately two weeks. After hatching the capelin is rarely seen until the next spawning season. Scale studies indicate that the life cycle may possibly be completed in one year. The food consists of small crustaceans, including euphausids. The capelin forms part of the food of spring and coho salmon and probably other piscivorous fishes, such as dog-fish. This delectable fish does not enter the commercial fishery but it is much prized by those who are able to be on the beaches at the time of the spawning run.

Range Juan de Fuca strait to northwestern Alaska.

Silver smelt *Hypomesus pretiosus* (Girard) 1854

Body elongate, relatively deep, depth approximately equal to length of head. Head elongate; snout pointed; mouth terminal, moderate; maxillary extending to point but little behind anterior margin of eye; teeth small, on jaws, vomer, palatines and tongue; opercle smooth, without striae. Fins: dorsal (1), 9 or 10, origin distinctly in front of origin of pelvic fins; adipose small, slender; anal, 14 to 16; pelvic, abdominal; pectoral, 14 or 15, shorter than head; caudal, furcate. Lateral line: slightly decurved, then straight. Scales: cycloid, moderate; on lateral line, 66 to 76; not in villous bands on sides of body in male. Colour: light olive green on dorsal surface; silvery to white on ventral surface; dark on opercle bright metallic silvery band sharply defined along side, becoming grayish black after fish has been removed from water. At spawning time in the male, light brown on dorsal surface, golden on ventral surface; in female, light green on dorsal surface, silvery white on ventral surface.

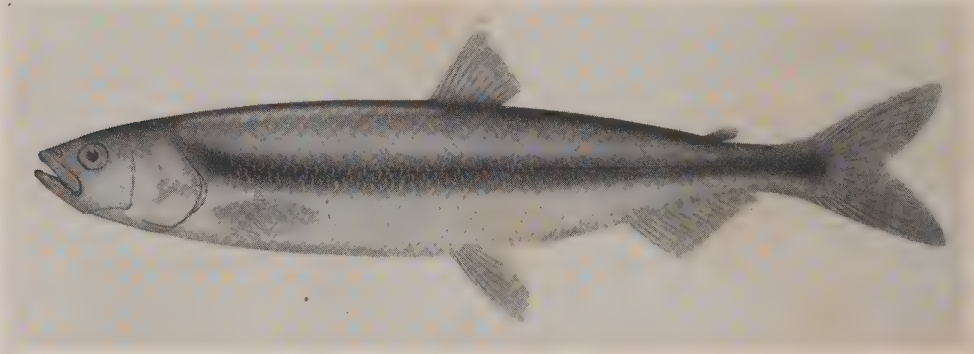

FIGURE 47. Silver smelt. *Hypomesus pretiosus* (Girard) 1854

Length to 10 inches.

Distinguished by the silvery to dusky band on each side of the body and the origin of the dorsal fin in front of the origin of the pelvic fins.

The silver smelt was first recorded from British Columbia waters in 1866 by A. Günther as *Hypomesus olidus* on the basis of three specimens taken in Esquimalt harbour by J. K. Lord and presented to the British Museum by Earl Russell. The species is common along the coast of British Columbia, especially in Boundary bay and the strait of Georgia. Spawning takes place from June to September on sandy beaches under conditions somewhat similar to those described for the capelin. A single female usually produces between 15,000 and 20,000 eggs. These hatch in about two weeks. The young disappear after hatching and may return in the first, second or third year. The food consists of small crustaceans and worms. The silver smelt forms part of the food of the spring salmon and other piscivorous fishes. Considerable numbers of this smelt are taken commercially with drag-seines and gill-nets at spawning time and find a ready sale in the fresh-fish market. Additional quantities are taken by amateur fishermen with rakes and dip-nets. This fish is also known as the surf smelt.

Range northern California to northwestern Alaska.

Eulachon *Thaleichthys pacificus* (Richardson) 1836

Body elongate, more or less slender. Head elongate; snout pointed; mouth terminal, large; maxillary extending to point below posterior margin of eye or slightly behind; teeth hooked, on jaws well developed, usually deciduous at spawning time, on vomer few, large, on palatines short, on tongue large, strong; opercle smooth, with well defined concentric striae following contour; rakers on first gill arch, 17 to 22. Fins: dorsal (1), 11 to 13, origin behind origin of pelvic fins; adipose small, slender, hooked; anal, 20 to 23; pelvic, abdominal; pectoral, 11 or 12, shorter than head; caudal, furcate. Lateral line: slightly decurved, then straight. Scales: cycloid, moderate; on lateral line, 75 to 78; not in villous bands in male but somewhat thickened at spawning time. Colour: uniform light bluish brown on dorsal surface; silvery white on sides and ventral surface; black stippling on back sparse, fine.

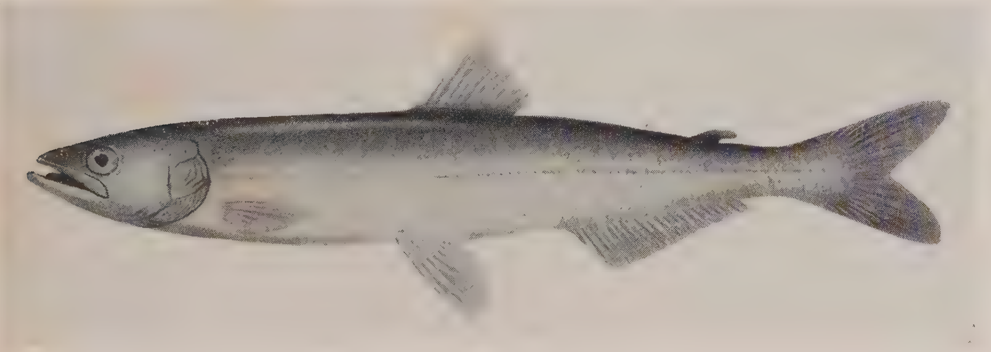

FIGURE 48. Eulachon. *Thaleichthys pacificus* (Richardson) 1836

Length to 12 inches.

Distinguished by the origin of the dorsal fin behind the origin of the pelvic fins and the striae on the opercles following the contours of the bones.

The eulachon was first recorded from British Columbia waters in 1866 by A. Günther on the basis of four specimens, 8 to 9 inches in length, collected near Vancouver island by C. B. Wood, surgeon on H.M.S. *Plumper* and presented to the British Museum. The eulachon is common along the whole coast of British Columbia, particularly in the larger inlets, and enters the rivers during March, April and May to spawn. The fish matures at two and three years of age and apparently dies after spawning. A female of average size produces about 25,000 eggs. In the Fraser river the eggs are deposited on the bottom above Mission, particularly near Nikomen island. Each egg is surrounded by two membranes, the outer of which is fragile and very adhesive, and when broken and reflected backward becomes firmly fixed to a sand grain. The inner membrane, attached to the outer by a slender peduncle, contains the embryo which develops into a larva. The eggs hatch in two or three weeks. The young fish apparently are carried by the river current to the sea where they develop to maturity. The food consists of small crustaceans. The eulachon in turn comprises a portion of the food of the spring salmon and the fur-seal. The eulachon is taken in consider able numbers in gill-nets for the fresh-fish market and is a very choice fish because of its flavour and richness. In recent years a considerable portion of the catch has been utilized as food for animals on fur farms. It is used extensively by the Indians for food and the production of oil for cooking. Previous to the advent of manufactured candles and other lighting devices these fish were dried, fitted with a wick and used as candles, hence the frequently used name candle-fish. In 1877 a factory was built on the Nass river for the manufacture of eulachon oil, which for the most part was sold to the local Indians although a small amount was actually shipped to England. The eulachon fishery reached a maximum production in 1903 of about 600 tons and has declined since then to one of minor importance. The Chinook jargon name eulachon is most frequently used as the common name for this fish and the above spelling should be adopted in preference to such variants as: oolachan, oolichan, oulachon, ulchen, etc.

Range northern California to northwestern Alaska.

Long-finned smelt *Spirinchus dilatus* Schultz and Chapman 1934

Body moderately elongate, compressed. Head elongate, snout pointed; mouth terminal, large, strongly oblique; maxillary extending to point below posterior margin of eye; teeth hooked, on jaws small, on vomer few, small, not canine-like, on tongue large, strong; opercle smooth, without striae; rakers on first gill arch, 36 to 44. Fins: dorsal (1), 6 to 10, origin above or behind origin of pelvic fins; adipose small, somewhat broad; anal, 16 to 22; pelvic, abdominal; pectoral, 10 to 12, as long as head or longer; caudal, furcate. Lateral line: slightly decurved, then straight. Scales: cycloid, moderate; on lateral line, 59 to 65; not in villous bands in breeding male. Colour: pale olive brown on dorsal surface; silvery white on sides and ventral surface; black stippling on head and dorsal surface of body dense, prominent, very conspicuous in males during breeding season; in young, black spots in 2 conspicuous rows, 1 on each side of mid-line, extending from head to caudal peduncle.

Length to 6 inches.

Distinguished by the origin of the dorsal fin slightly behind the origin of the pelvic fins, the long pectoral fins, the opercles without striae and the fine black stippling on the head and the body.

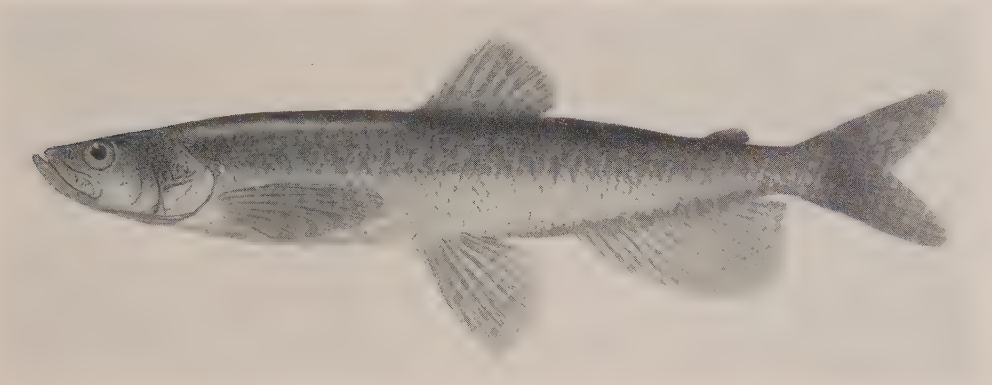

FIGURE 49. Long-finned smelt. *Spirinchus dilatus* Schultz and Chapman 1934

The long-finned smelt was first taken in British Columbia waters in 1921 when a single specimen was obtained from Harrison lake by Dr. R. E. Foerster. The first specimen caught in salt water was obtained January 4, 1929, from Burrard inlet in a shrimp trawl by Dr. A. A. Berkeley Needler and was recorded in 1935 by L. P. Schultz and A. C. DeLacy. This individual is now in the Vancouver Museum. These specimens were secured before the species was recognized and described in 1934. In November, 1938, a small individual was taken near Prince Rupert. The long-finned smelt inhabits depths of from 10 to 70 fathoms and is captured frequently during the winter months, particularly by shrimp trawls which encounter the schools accidentally. Spawning takes place from October to December in streams near the sea at the end of the second year and whether the fish die after spawning is not known. Small specimens between 2 and 3 inches in length have been secured in May in the Fraser river below New Westminster. The food consists of small crustaceans. This smelt has a fine flavour and has a ready sale though the quantity is limited due to the difficulty of locating the fish.

Range Oregon to northern British Columbia.

Suborder OPISTHOPROCTOIDEA

The fishes in this suborder have an adipose fin. No photophores or luminous organs are present on the body or head. They are closely related to the Salmonoidea but are deep-water marine fishes with very large eyes, sometimes telescopic, and with reduced mouths and teeth.

Two families are represented in British Columbia waters: Bathylagidae and Macropinnidae.

Family BATHYLAGIDAE Black smelts

In the black smelts the mouth is small and weak and the eyes are very large. The scales are large, thin, deciduous and cycloid. A small adipose fin is present. The lateral line is absent. There are no fleshy appendages at the bases of the pelvic fins. The colours are dark brown to black.

The black smelts are bathypelagic, inhabiting both the Atlantic and Pacific oceans.

Slender black smelt *Bathylagus pacificus* Gilbert 1890

Body elongate, slender; caudal peduncle slender. Head large, deep, compressed; snout blunt; mouth terminal, small; maxillary scarcely reaching to point below middle of pupil; teeth small; eye moderately large, diameter 2.3 to 3.2 in length of head; interorbital space moderately concave; median occipital ridge absent. Fins: dorsal (1), 8 to 10; adipose, small; anal, 18 to 20; pelvic, abdominal; caudal, furcate. Lateral line: absent. Scales: cycloid, moderate, deciduous; in oblique rows above midline of body, 37 to 42. Colour: black to blackish brown; bluish black on head and ventral surface; bluish black on peritoneum.

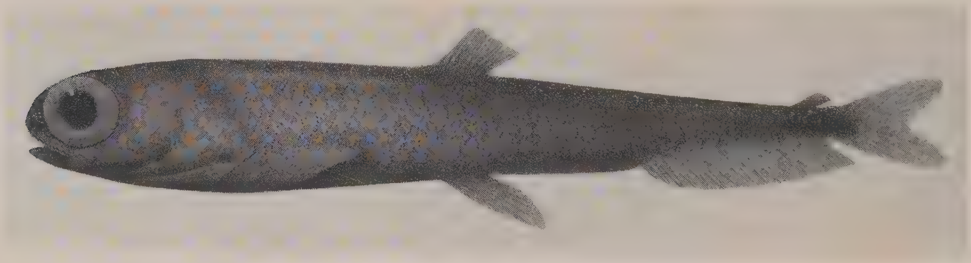

FIGURE 50. Slender black smelt. *Bathylagus pacificus* Gilbert 1890

Length to 7½ inches.

Distinguished by the very large eyes, the black coloration, the scales in oblique rows above midline of body more than 30 and the absence of a ridge from the top of the head.

The slender black smelt was first taken in British Columbia waters May 21, 1931, northwest of the Queen Charlotte islands by the International Fisheries

Commission, station 386C, lat. 54° 18′ N., long. 134° 27′ W., depth between 379 and 488 fathoms and recorded in 1940 by W. M. Chapman. Only a single specimen was secured and it is the only occurrence known for the province.

Range southern California to northwestern Alaska.

Big-scaled black smelt *Bathylagus milleri* Jordan and Gilbert 1898

Body elongate, deep anteriorly; caudal peduncle, slender. Head large, deep, compressed; snout blunt; mouth terminal, small; maxillary extending slightly behind anterior margin of pupil of eye; teeth small; eye very large, diameter 2 to 2.8 in length of head; interorbital space flat to concave; median occipital ridge strongly developed. Fins: dorsal (1), 7 to 9; adipose, small; anal, 23 to 27; pelvic, abdominal; caudal, furcate. Lateral line: absent. Scales: cycloid, large, thin, deciduous; in oblique rows above midline of body, 23 to 27. Colour: black to blackish brown; bluish black on peritoneum.

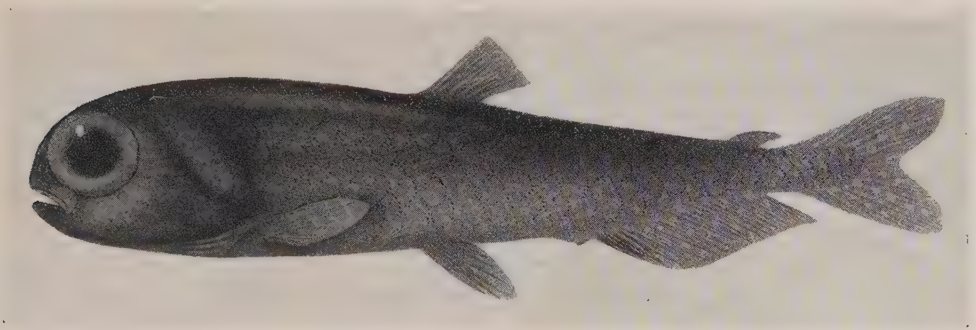

FIGURE 51. Big-scaled black smelt. *Bathylagus milleri* Jordan and Gilbert 1898

Length to 6¼ inches.

Distinguished by the very large eyes, the black coloration, the scales in oblique rows above midline of body fewer than thirty and the presence of a median ridge on the top of the head.

The big-scaled black smelt was first taken in British Columbia waters May 19, 1906, southwest of Moresby island by the *Albatross*, station 4758, lat. 52° 02′ N., long. 132° 21′ W., depth 1,600 fathoms, represented by two small specimens 1½ and 2 inches in length respectively and recorded in 1912 by C. H. Gilbert and C. V. Burke. Since March 16, 1929, the big-scaled black smelt has been taken on several occasions in the vicinity of the Queen Charlotte islands by the International Fisheries Commission at nine stations at various depths between 220 and 488 fathoms, and recorded in 1939 by W. M. Chapman as a new species, *Bathylagus alascanus*. The latter name is now considered to be synonymous with *B. milleri*.

Range southern California to northwestern Alaska.

In the barrel-eyes the head is grotesque with a small mouth, a pair of very large vertically directed cylindrical eyes and an enormous development of the opercular apparatus. The fins are very large and greatly elongate; the pelvic fins are high on the body without fleshy appendages at their bases; an adipose fin is present. A lateral line is present.

This family was established to embrace a new species taken by the International Fisheries Commission in northeastern Pacific waters.

Barrel-eye *Macropinna microstoma* Chapman 1939

Body short, deep. Head large; mouth terminal, very small; teeth small or absent; snout elongate, flat, broad, shovel-like; eye very large, on cylindrical base, directed upward, high on head, cornea projecting beyond dorsal outline; preopercle greatly expanded ventrally; gill membranes broadly united, joined to isthmus with broad free fold posteriorly. Fins: dorsal (1), 11, far back on body; adipose elongate, slender; anal, 14; pelvic, 10, abdominal, very elongate, inserted high on side of body, slightly posterior to base of pectoral, tip, in adult, reaching base of caudal; pectoral, broad; caudal, short, broadly furcate. Lateral line: almost straight. Scales: cycloid, large, deciduous; on lateral line, 24 to 26. Luminous organs: absent from body and head. Colour: dark brown in adult; light coloured with distinctive pigment bars in larval stages.

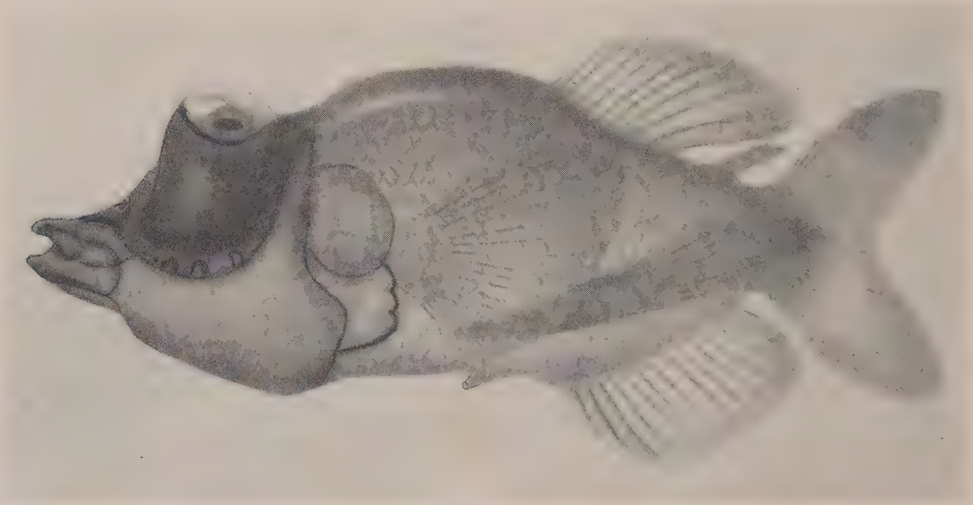

FIGURE 52. Barrel-eye. *Macropinna microstoma* Chapman 1939

Length to 1¾ inches.

Distinguished by the large upwardly directed eyes, the shovel-like snout and the very long pelvic fins inserted high on each side of the body.

The barrel-eye was first taken in British Columbia waters March 17, 1929, north of Graham island by the International Fisheries Commission, station 192, lat. 54° 22′ N., long. 132° 18′ W., depth 54 to 143 fathoms. A large specimen, 1¾ inches in length, selected for description as the type, was secured March 28, 1932, west of Graham island, station 621C, lat. 53° 50′ N., long. 134° 20′ W., depth 379 to 487 fathoms, recorded in 1939 by W. M. Chapman and deposited in the United States National Museum. Six other specimens at six other stations near the Queen Charlotte islands have also been obtained by the Commission at depths between 54 and 487 fathoms. A series of young stages from a length of ¼ of an inch upward have shown that considerable changes in body form take place during development. However, the large head and the long flat snout can be recognized even in the smallest specimens.

Range Queen Charlotte islands to northwestern Alaska.

Suborder STOMIATOIDEA

The fishes in this suborder have photophores which are in parallel rows on the body. Luminous organs, scales and an adipose fin may or may not be present.

Four families are represented in British Columbia waters: Gonostomatidae, Sternoptychiidae, Chauliodontidae and Stomiatidae.

Family GONOSTOMATIDAE Angle-mouths

In the angle-mouths the body is elongate and slender, covered with cycloid scales. The mouth is very large with small teeth and the eyes are small. The dorsal fin is far back on the body over the anal fin, the pelvic fins are slightly anterior to the midlength of the body and the adipose fin is absent.

These are deep-sea fishes of wide distribution.

Veiled angle-mouth *Cyclothone microdon* (Günther) 1878

Body elongate, rather slender, little compressed. Head conical, compressed; mouth terminal, large; maxillary extending to point far behind eye; teeth on jaws

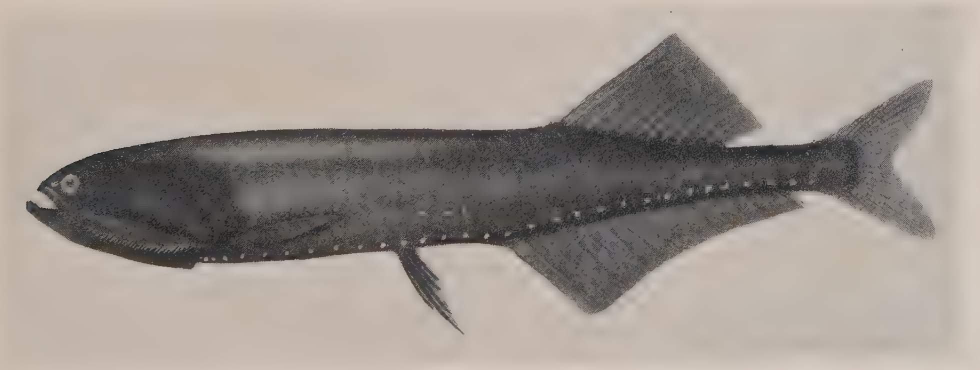

FIGURE 53. Veiled angle-mouth. *Cyclothone microdon* (Günther) 1878

and vomer small, needle-like; eye small, diameter 7 to 10 in length of head. Fins: dorsal (1), 12 to 14, far back on body, origin posterior to vertical from origin of pelvic fins; adipose, absent; anal, 17 to 21, large; pelvic, 5 or 6, abdominal, short; pectoral, 9 or 10, very narrow; caudal, furcate. Lateral line: absent. Scales: cycloid, large, deciduous; in oblique rows above midline of body, 28 to 33. Photophores: on body in two rows more or less parallel on abdomen; ventrolateral row, 7 to 11; ventral row, 31 to 35, extending onto caudal peduncle; on head in one row below lower jaw, 8 to 10. Colour: brownish black to black.

Length to 3 inches.

Distinguished by the elongate body, the posterior position of the dorsal fin, the large anal fin, the two rows of photophores parallel along the lower portion of each side of the abdomen and the small needle-like teeth.

The veiled angle-mouth was first taken in British Columbia waters March 17, 1929, off cape Knox, Queen Charlotte islands, by the International Fisheries Commission, station 189C, lat. 54° 08′ N., long. 134° 06′ W., depth 379 to 488 fathoms, when a single specimen was secured and recorded in 1940 by W. M. Chapman. Five other individuals were obtained in May, 1930, in the vicinity of Queen Charlotte sound, and in May, 1931, another individual was secured off cape Knox. These all were captured somewhere between 54 and 650 fathoms in tow-nets by the International Fisheries Commission but specimens have been taken in the mid-Pacific by the *Challenger* expedition in a haul from 2,900 fathoms.

Range southern California to northwestern Alaska.

Family STERNOPTYCHIDAE Hatchet-fishes

In the hatchet-fishes the body is very greatly compressed, very deep anteriorly and slender posteriorly, thus somewhat hatchet-shaped. The mouth is large with small teeth and the eyes are large, directed upward. Scales are absent. The dorsal fin is preceded by large projecting neural processes forming a bony plate. A long low adipose fin is sometimes present.

These are small oceanic fishes usually living at considerable depths but coming near the surface at night.

Silvery hatchet-fish *Argyropelecus olfersii* (Cuvier) 1829

Body short, very deep anteriorly, extremely compressed. Head large, much compressed; mouth terminal, large; jaws almost vertical; teeth small; eye large, diameter about 3 in length of head, directed upward. Fins: dorsal (1), 9, short; adipose long, low; anal (2), 7 - 5, separated by small interspace; pelvic, 6, abdominal, small; pectoral, 10 or 11, very low on body; caudal, furcate. Lateral line: absent. Scales: absent. Photophores: numerous, large, in two more or less parallel rows along ventrolateral region of abdomen; from abdomen to caudal peduncle in single row. Spines: above shoulder, 1, small; at lower posterior extremity of abdomen, 1, divided into two spinules, one projecting forward, other backward. Neural processes: 7 or 8, projecting above back immediately in front of dorsal fin, low anteriorly, progressively higher posteriorly. Colour: silvery, overlying brown to black substratum; silvery to white on fins; black on margins of photophores.

Length to 2¼ inches.

Distinguished by the deep highly compressed body, the almost vertical jaws, the upwardly directed eyes, the projecting neural processes, the rows of photophores along the lower portion of the body and the silvery coloration.

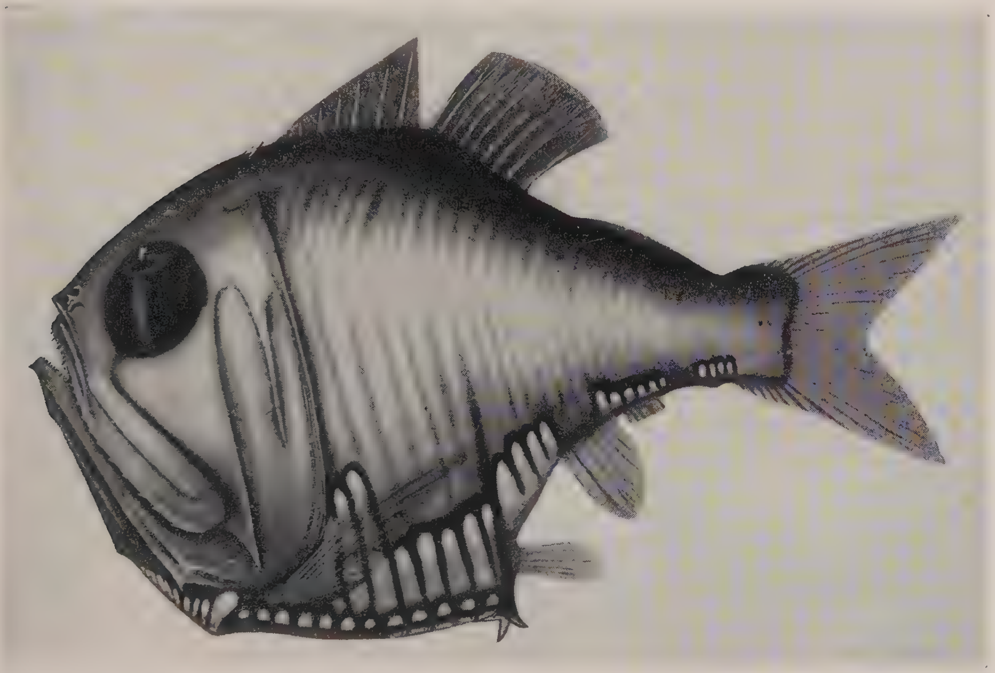

FIGURE 54. Silvery hatchet-fish. *Argyropelecus olfersii* (Cuvier) 1829

The silvery hatchet-fish has been taken but once in British Columbia waters. The specimen was obtained June 13, 1935, in English bay off Jericho beach by Mr. Y. Kondo at a depth of about 30 fathoms in a shrimp trawl. The specimen is now in the fish collection of the University of British Columbia. Apparently this fish is found ordinarily at great depths in the tropical Pacific ocean, depths ranging from 286 to 2,232 fathoms having been recorded.

Range southern California to strait of Georgia.

Family CHAULIODONTIDAE Viper-fishes

In the viper-fishes the body is elongate and slender, covered with cycloid scales. The mouth is very large with fang-like teeth and the eyes are moderately small. The dorsal fin is far forward on the body with the first ray separate and greatly elongate; the pelvic fins are slightly anterior to the midlength of the body and an adipose fin is present.

These are small fishes living for the most part in the depths of the ocean.

Fanged viper-fish *Chauliodus macouni* Bean 1890

Body elongate, rather slender, tapering to short slender caudal peduncle; deepest at head. Head relatively large; snout concave; mouth terminal, extensive, gaping; teeth on premaxillary, 4, very long, fang-like, on maxillary and palatines, small, on mandible very long, fang-like, wide-set; eye large, diameter 3.3 to 4.4 in length of head. Fins: dorsal (1), 6 or 7, near head, first ray separated from remainder of fin, produced into long filament about one-quarter length of body; adipose, large; anal, 10 to 12, rather small, slightly larger than adipose; pelvic, 7 or 8, abdominal, long, narrow; pectoral, 12 or 13, relatively broad; caudal, furcate. Lateral line: absent. Scales: cycloid, moderate, thin; in oblique rows above midline of body, about 56. Photophores: on body in two parallel rows; ventrolateral row, 40 to 46; ventral row, 54 to 58; on head below eye, 2, one anterior, one posterior; below lower jaw in one row, 18 to 21. Colour: dark brown to black.

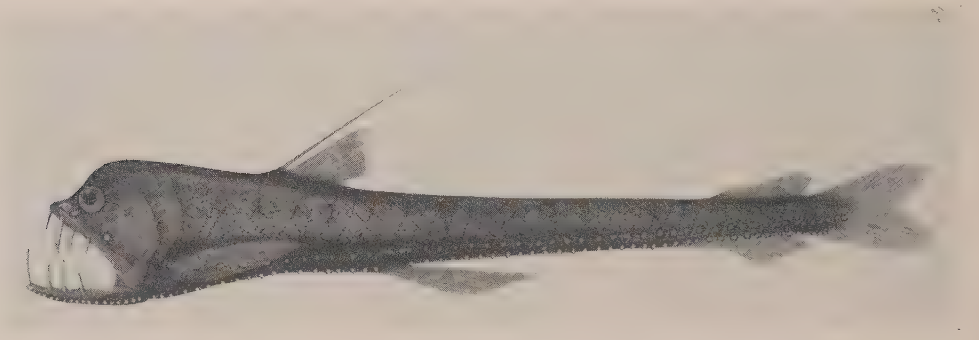

FIGURE 55. Fanged viper-fish. *Chauliodus macouni* Bean 1890

Length to 4¼ inches.

Distinguished by the elongate body, the very long fang-like teeth in the gaping mouth, the presence of an adipose fin, the forward position of the dorsal fin with the long filamentous ray and the two rows of photophores along the lower portion of the body.

The fanged viper-fish was first taken in British Columbia waters August 29, 1888, off the Queen Charlotte islands near cape St. James by the *Albatross*, station 2860, lat. 51° 23′ N., long. 130° 34′ W., depth 876 fathoms, recorded in 1890 by T. H. Bean as the type of a new species and deposited in the United States National Museum. From 1929 to 1934 large numbers were taken in tow-nets by the International Fisheries Commission at 58 stations off the west coasts of

Vancouver and the Queen Charlotte islands at depths from 54 to 487 fathoms. Specimens taken off the coast of California were found to have fed upon the arrow-worm, *Sagitta*.

Range southern California to northwestern Alaska.

Family STOMIATIDAE Stomiatids

In the stomiatids the body is elongate, very slender, without scales. The mouth is large with well developed teeth, the eyes are very small and a barbel is present under the lower jaw. The dorsal fin is far back on the body over the anal fin; the pelvic fins are well behind the mid-length of the body and the adipose fin is absent.

These fishes frequently live at very great depths and are usually said to be abyssal.

Arrow-fish *Tactostoma macropus* Bolin 1939

Body very elongate, slender, almost cylindrical. Head very short, length 7 to 9 in standard length; mouth terminal, very large, upcurved; maxillary more than half length of head; teeth depressible, on jaws arranged in several rows, varying in size from minute denticles to moderate sized fangs, on tongue in 2 rows of 6 or 7 each, large, fang-like; eye very small; barbel on lower jaw, small; gill membranes united, attached anteriorly to isthmus. Fins: dorsal (1), 14 to 16, very far back on body; anal, 19 or 20, very far back, origin below that of dorsal; pelvic, 8 to 10, abdominal, large, behind middle of body; pectoral and adipose, absent; caudal, small, furcate. Lateral line: absent. Scales: absent. Photophores: on body; in two parallel rows to anal fin; ventrolateral row, 73 to 79; ventral row, isthmus to pelvic fin, 54 to 57, pelvic fin to anal fin, 19 to 21, above anal fin, 12 or 13; on head: suborbital, 1, large, with deeply embedded globular lens; opercular, 1, small; branchiostegal, 14. Luminous organs on head: in front of eye, 3; behind eye, 1. Glandular bodies: on body and head numerous, minute. Colour: jet black; black on barbel; pale green on suborbital photophore in life; light gray on posterior of lower jaw; rich brown in young.

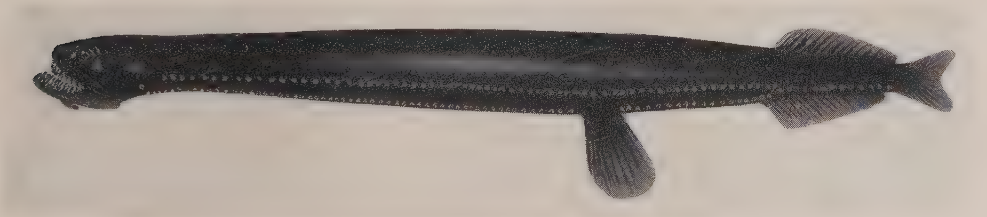

FIGURE 56. Arrow-fish. *Tactostoma macropus* Bolin 1939

Length to 11 inches.

Distinguished by the elongate cylindrical body, the absence of pectoral fins, the posterior positions of the dorsal, anal and pelvic fins, the two rows of numerous photophores along the lower portion of each side of the body and the large teeth on the jaws and on the tongue.

The arrow-fish was first taken in British Columbia waters April 14, 1932, south of cape St. James by the International Fisheries Commission, station 665C, lat. 51° 16′ N., long. 130° 35′ W., depth between 379 and 487 fathoms. A second specimen was secured January 3, 1935, station 1256C, lat. 51° 15′ N., long. 131° 37′ W., between the same depths. This fish was described as a new species, *Pholonectops multipunctata*, in 1939 by W. M. Chapman who was unaware of the description by Rolf L. Bolin of the same species based on another specimen taken off Monterey bay, California, and whose publication predated his by a short time.

Range northern California to Queen Charlotte sound.

Order INIOMI

In this order the premaxillary bone forms the margin of the upper jaw. The fins have rays only; the pelvic fins are abdominal or thoracic (abdominal in British Columbia species); and an adipose fin is usually present (present in British Columbia species). The scales, when present, are cycloid.

Two suborders are represented along the British Columbia coast: Myctophoidea and Alepidosauroidea.

Suborder MYCTOPHOIDEA

The fishes in this suborder are of small size and with the body deep in relation to the length. The mouth is large and the teeth are small. Photophores are numerous and luminous organs are present in all the species herein recorded.

One family, the Myctophidae, is represented in British Columbia waters.

Family MYCTOPHIDAE Lantern-fishes

The lantern-fishes are so named because of the presence of numerous light-producing organs on the head and body. The photophores have definite positions and are named accordingly as shown in the accompanying drawing. Variations in the positions and numbers of these photophores occur among the various species and thus form a useful means for identification.

Big-eyed lantern-fish *Electrona thompsoni* Chapman 1944

Body elongate, stout, greatest depth 3 to 3.9 in standard length, in front of dorsal fin. Head large, deep, anterior profile rounded; mouth terminal, large; maxillary extending to point slightly behind eye, greatly expanded posteriorly; teeth small, villiform; eye large, diameter 2 to 2.8 in length of head. Fins: dorsal (1), 11 to 13; adipose, large; anal, 22 to 25, very large, origin below middle of dorsal; pelvic, 8, abdominal; pectoral, long, tip reaching to point slightly in front of anus; caudal, furcate. Lateral line: slightly decurved, then straight.

Scales: cycloid, moderate; on lateral line, 35 to 39. Photophores: Vn, small; Op_1, absent; Op_2, above and behind maxillary; PLO, well below base of pectoral fin, above, slightly behind PO_2; PVO_1, behind PLO, above interspace between PO_2 and PO_3; PVO_2, at base of pectoral fin; VLO, about midway between, forming straight line with, PVO_2 and SAO_1; SAO_1, behind VLO above VO_3; SAO_2, on same level, above origin of anal fin; SAO_3, about half distance between lateral line and AO_1; Pol, absent; PO, 5, on same level, PO_3 and PO_5 closer together than PO_1 and PO_2; VO, 4, on same level; AO, 15 to 18, in single continuous series; Prc, 2, well separated from most posterior AO. Luminous organs; supracaudal or infracaudal, not both on same individual. Colour: metallic blue on dorsal surface; bright silvery on ventral surface.

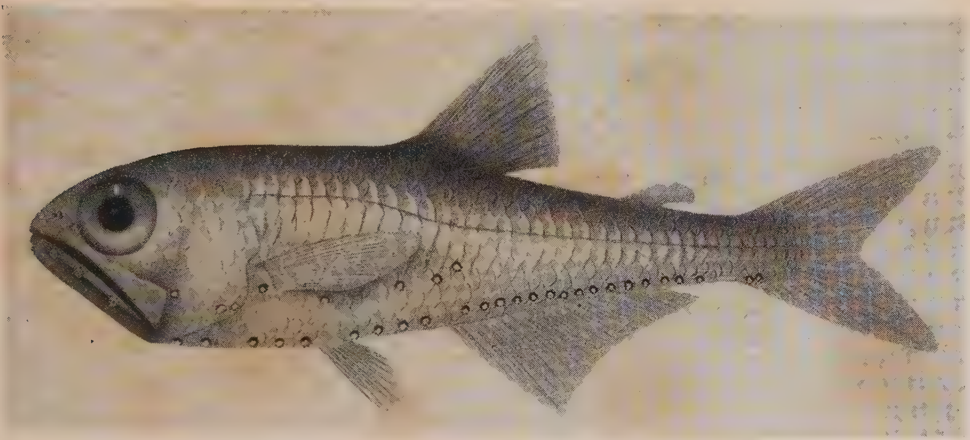

FIGURE 57. Big-eyed lantern-fish. *Electrona thompsoni* Chapman 1944

Length to 2 inches.

Distinguished by the presence of 2 precaudal photophores well separated from the anal photophores, the 15 to 18 anal photophores in a continuous row, the absence of a posterolateral photophore and the large eyes.

The big-eyed lantern-fish was first taken in British Columbia waters March 10, 1929, west of cape Scott by the International Fisheries Commission, station 171C, lat. 50° 34′ N., long, 129° 27′ W., in a vertical haul between 487 and 379 fathoms. Specimens were also taken by the Commission at twelve other stations in the vicinity of the Queen Charlotte islands. The species was originally described in 1939 by W. M. Chapman as *Myctophum oculeum*, which name was preoccupied by Garman and so was renamed in 1944 as *Electrona thompsoni*.

Range Washington to northwestern Alaska.

Blue lantern-fish (Fig. 1). *Tarletonbeania crenularis* (Jordan and Gilbert) 1880

Body elongate, stout anteriorly, greatest depth 4.2 to 4.8 in standard length, through base of pectoral fin; caudal peduncle elongate, slender. Head moderate, deep; mouth terminal, large, maxillary extending to point far behind eye; teeth small, villiform; eye moderate, diameter 3.2 to 3.7 in length of head. Fins: dorsal (1), 11 to 14; adipose, small; anal, 17 to 19, large, origin below middle of dorsal; pelvic, 7 or 8, abdominal, small; pectoral small, tip barely reaching to point above origin of pelvic; caudal, furcate. Lateral line: very short, length less than that of head, represented by pores on anterior 2 or 3 scales only. Scales: cycloid, small, margins crenulate; in oblique rows above midline of body, 48 to 52. Photophores: Dn, small, deeply embedded; Suo, small; Vn, large; Op_1, small;

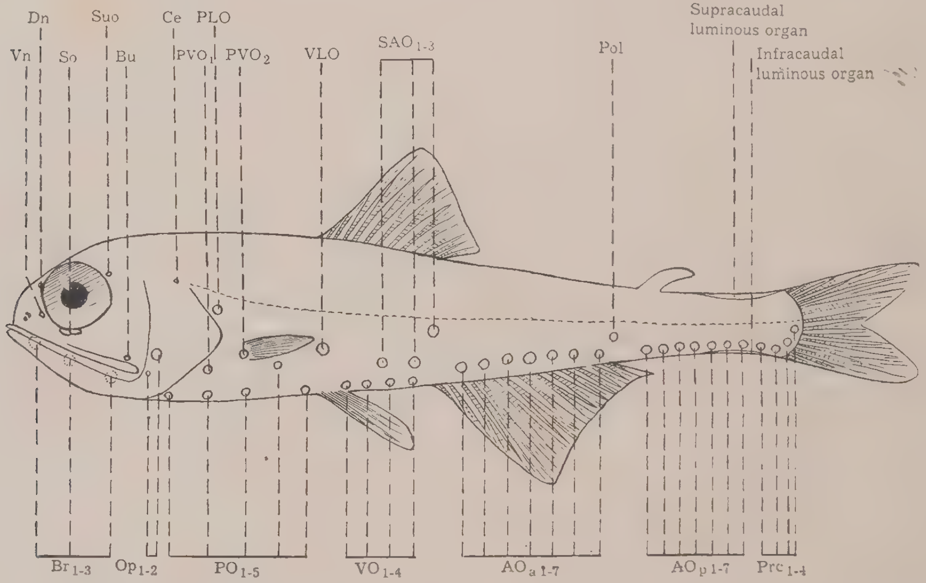

FIGURE 58. A hypothetical myctophid showing the general distribution and terminology of the photophores. Dn—dorsonasal; Suo—supraorbital; Ce—cervical; Vn—ventronasal; So—suborbital; Br—branchiostegal; Bu—buccal; Op—opercular; PLO—suprapectoral; PVO—subpectoral; VLO—supraventral; SAO—supraanal; Pol—posterolateral; PO—thoracic; VO—ventral, AO_a—anterior anal, AO_p—posterior anal; Prc—precaudal.

Op_2, large; PLO, small below level of upper ray of pectoral fin, covered by subopercle; PVO_1, immediately below subopercle; PVO_2, at base of pectoral fin, about above PO_3; VLO, on level with PVO_2, about above base of pelvic fin; SAO_1, above and slightly behind posterior VO; SAO_2, behind SAO_1 and slightly above, directly above origin of anal fin; SAO_3, near lateral line, above origin of anal fin; Pol, 1, above posterior AO_a; PO, 5 to 8, in straight line and on same level; VO, 5 to 7, on same level; AO, in two series, AO_a, 9 to 12, AO_p, 3 to 5 (not always same number on both sides of body); Prc, 1, widely separated from posterior AO_p but on same level. Luminous organs: in male, supracaudal only; in female, none. Colour: bright metallic blue on dorsal surface; bright silvery on ventral surface; vivid electric blue light emitted from photophores in life.

Length to 3 inches.

Distinguished by the low position of the suprapectoral photophore, the single precaudal photophore, the short lateral line and the slender caudal peduncle.

The blue lantern-fish was first taken in British Columbia waters March 7, 1929, in Juan de Fuca strait by the International Fisheries Commission, station 165B, lat. 48° 00′ N., long. 125° 41′ W., in a vertical haul between 260 and 173 fathoms and recorded in 1940 by W. M. Chapman. In the same year a specimen was obtained west of cape Scott and eleven others in Queen Charlotte sound at depths between 54 and 487 fathoms. Specimens have been obtained from the stomachs of albacore from California to British Columbia.

Range southern California to northwestern Alaska.

Big-finned lantern-fish

Myctophum californiense Eigenmann and Eigenmann 1889

Body elongate, slender, greatest depth about 5 in standard length, in front of pectoral fin. Head moderate, pointed; mouth terminal, large; maxillary extending to point well behind eye; teeth small, villiform; eye moderate, diameter about 3 in length of head. Fins: dorsal (1), 14 or 15; adipose, small; anal, 20 to 22, moderate, origin below insertion of dorsal; pelvic, 8, abdominal; pectoral, moderate, tip reaching to point well behind insertion of pelvic; caudal, furcate. Lateral line: 38 to 42. Photophores: Vn, small, deeply embedded; Op_1, small; Op_2, large; PLO, in advance of pectoral fin, about midway between lateral line and base of pectoral fin; PVO_1, about midway between PVO_2 and PO_1; PVO_2, near base of lower pectoral fin rays; VLO, above origin of pelvic fin, about midway between lateral line and base of pelvic fin; SAO_1, above interspace between VO_2 and VO_3; SAO_2, above VO_4; SAO_3, close to lateral line above origin of anal fin; Pol, 1, close to lateral line above interspace between AO_a and AO_p; PO, 5, in

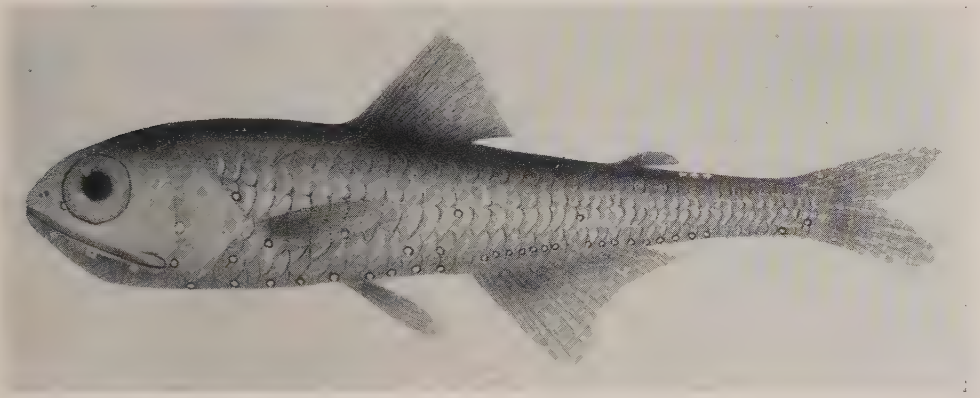

FIGURE 59. Big-finned lantern-fish. *Myctophum californiense* Eigenmann and Eigenmann 1889

straight line, about evenly spaced, on same level; VO, 4, on same level; AO, in two series, AO_a, 6 or 7, AO_p, 8 to 10; Prc, 2, well separated from posterior AO_p, Prc_2, posterior to and slightly higher than Prc_1. Luminous organs: supracaudal in male, 3 to 6; infracaudal in female, 4 to 8. Colour: black on dorsal surface; silvery on sides; dusky at bases of fins. Pale greenish light emitted by photophores.

Length to 4½ inches.

Distinguished by the presence of two precaudal photophores well separated from the anal photophores, the position of the suprapectoral photophore above the pectoral fin and the anal photophores in two groups, the anterior series of 7 or 8 and the posterior series of 8 to 11.

The big-finned lantern-fish was first recorded from British Columbia waters in the neighbourhood of Vancouver island in 1864 by A. Günther as *Scopelus boops*. This is the only known record from these waters.

Range southern California to Vancouver island.

White-spotted lantern-fish *Diaphus rafinesquii* (Cocco) 1820

Body elongate, moderately stout, greatest depth 4 to 4.4. in standard length in front of dorsal fin; caudal peduncle stout. Head moderately large, deep; anterior profile rounded; mouth terminal, large; maxillary extending to point well behind eye; teeth small, villiform; eye large, diameter 2.6 to 3.2 in length of head. Fins: dorsal (1), 13 to 15; adipose, small; anal, 12 to 14, small, origin behind insertion of dorsal; pelvic, 8, abdominal; pectoral, moderate, tip not reaching to point above origin of pelvic; caudal, furcate. Lateral line: slightly decurved, then straight. Scales: cycloid, moderate; on lateral line, 34 to 37. Photophores: Dn, conspicuously large, circular; So, imperfectly divided into long slender anterior portion, separated from minute posterior portion by strand of black pigment; Op_1, small; Op_2, large; PLO, above base of pectoral fin; PVO_1,

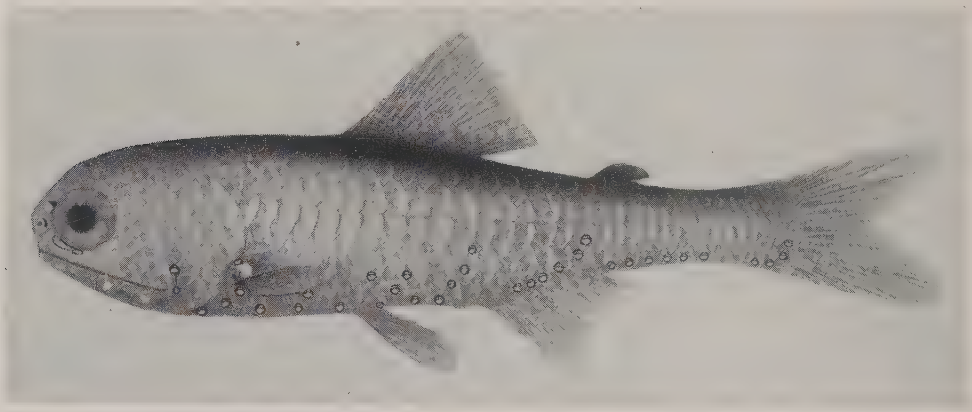

FIGURE 60. White-spotted lantern-fish. *Diaphus rafinesquii* (Cocco) 1820

about midway between PO$_1$ and PVO$_2$; PVO$_2$, in front of lower rays of pectoral fin; VLO, behind base of pectoral fin directly above base of pelvic; SAO$_1$, behind and slightly above VO$_5$; SAO$_2$, behind and above SAO$_1$; SAO$_3$, behind and above SAO$_2$, about midway between it and lateral line; Pol, 1, above interspace between posterior AO$_a$ and anterior AO$_p$; PO, 5, PO$_1$, under opercle, interspace between PO$_1$ and PO$_2$, long, PO$_4$, slightly elevated; VO, 5, VO$_2$ and VO$_3$ much elevated; AO, in two series, AO$_a$, 4 to 6, AO$_p$, 4 to 7; Prc, 4, in curve following base of caudal fin, Prc$_1$, separated from posterior AO$_p$ by interspace slightly greater than that between AO$_a$ and AO$_p$. Luminous organs: suprapectoral, 1, large, below and contiguous with PLO; absent from caudal peduncle. Colour: brown to black on dorsal surface; lighter on ventral surface; pale on fins; black on slightly curved septum separating upper and lower parts of body photophores.

Length to 2¾ inches.

Distinguished by the four precaudal photophores, the large dorsonasal photophores, the black septa dividing the photophores on the body, the large luminous organ above the base of each pectoral fin and the absence of luminous organs from the caudal peduncle.

The white-spotted lantern-fish was first taken in British Columbia waters September 2, 1891, off Port San Juan by the *Albatross*, station 3459, lat. 48° 24′ N., long. 124° 24′ W., depth 123 fathoms and recorded in 1895 by C. H. Gilbert as *Diaphus theta* Eigenmann and Eigenmann. It occurs along the whole coast at depths ranging from 25 to 325 fathoms and is captured frequently in English bay in shrimp trawls at depths of 25 and 35 fathoms. Thirteen specimens have been obtained off the Queen Charlotte islands by the International Fisheries Commission at eleven stations at depths ranging from 54 to 325 fathoms. Off the coast of Washington the species has been found at a depth of 584 fathoms and in Alaskan waters near Mount Edgecumbe at 922 fathoms.

Range southern California to northwestern Alaska.

Small-finned lantern-fish

Lampanyctus leucopsarus (Eigenmann and Eigenmann) 1890

Body elongate, slender, greatest depth about 5 in standard length, in front of dorsal fin. Head elongate, bluntly pointed; mouth terminal, large; maxillary extending to point far behind eye; teeth small, villiform; eye moderate, diameter 3.5 to 4.5 in length of head. Fins: dorsal (1), 12 to 15; adipose, small; anal, 14 to 16, small, origin below posterior third of dorsal; pelvic, 8 or 9, abdominal; pectoral, minute, length about equal to diameter of eye, tip far in advance of origin of pelvic; caudal, furcate. Lateral line: slightly decurved, then straight. Scales: cycloid, moderate; on lateral line, 35 to 38. Photophores: Vn, small; Op$_1$, small; Op$_2$, large; PLO, in advance of pectoral fin, about midway between lateral line and base of pectoral fin; PVO$_1$, well in front of PO$_2$, about below PVO$_2$; PVO$_2$, in front of base of pectoral fin; VLO, about midway between lateral line and VO$_1$; SAO$_1$, behind and slightly above posterior VO; SAO$_2$, behind and above SAO_1; SAO_3, behind and above SAO_2; Pol, 1, about one-third distance from lateral line to insertion of anal fin; PO, 5 or 6, PO_4 much elevated, above interspace between PO_3 and PO_5; VO, 3 to 5, following contour of abdomen; AO, in two series, AO_a, 5 to 7, AO_p, 6 to 8; Prc, 4, separated from AO_p, evenly spaced, Prc_4 well below lateral line. Luminous organs: supracaudal, 5 to 8; infracaudal, 7 to 9. Colour: gray to dark greenish blue on dorsal surface; lighter on ventral surface; black on opercle and fins; golden or claret on photophores in life.

Length to 5 inches.

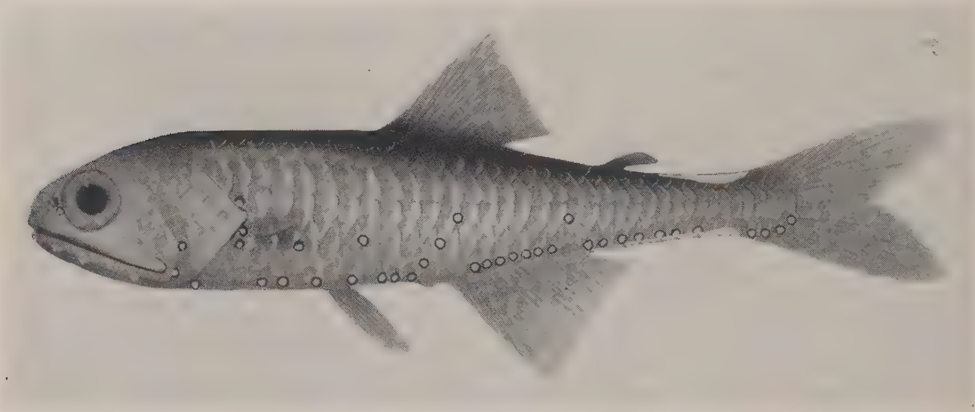

FIGURE 61. Small-finned lantern-fish. *Lampanyctus leucopsarus* (Eigenmann and Eigenmann) 1890

Distinguished by the very small pectoral fins, the luminous organs above and below the caudal peduncle, the single posterolateral photophore on each side of the body and the black coloration on the fins.

The small-finned lantern-fish was first taken in British Columbia waters September 3, 1890, west of Moresby island by the *Albatross*, station 3342, lat. 52° 39′ N., long. 132° 38′ W., depth 1,588 fathoms and recorded in 1895 by C. H. Gilbert as *Lampanyctus nannochir* (Gilbert). The species is common along the whole coast. Between February 18, 1929, and March 25, 1934, specimens were obtained at 142 stations from Juan de Fuca strait to Alaska by the International Fisheries Commission at depths ranging from 22 to 650 fathoms.

Range southern California to northwestern Alaska.

Small-eyed lantern-fish *Lampanyctus regalis* (Gilbert) 1891

Body elongate, slender, greatest depth 5 to 5.9 in standard length, in front of dorsal fin. Head elongate, pointed; mouth terminal, very large, maxillary extending to point far behind eye; teeth small, villiform; eye small, diameter 5.4 to 6.5 in length of head. Fins: dorsal (1), 14 to 16, large; adipose, large; anal, 17 to 19, large, origin below posterior third of dorsal; pelvic, 8, abdominal; pectoral, long, tip reaching to point slightly behind origin of pelvic; caudal, furcate. Lateral line: slightly decurved, then straight. Scales: cycloid, moderate; on lateral line, 36 to 39. Photophores: very small; on body, flattened, reflecting downward; Ce, small; Vn, small; Bu, very small; Op_1, small; Op_2, moderate; PLO, high, about one-quarter distance from lateral line to base of pectoral fin; PVO_1, above interspace between PO_1 and PO_2; PVO_2, at base of uppermost ray of pectoral fin; VLO, above insertion of pelvic fin, close to lateral line; SAO_1, about midway between lateral line and interspace between VO_2 and VO_3; SAO_2, behind SAO_1, about midway between lateral line and origin of anal fin; SAO_3, close to lateral line, behind SAO_2; Pol, 2, Pol_1 close to posterior end of AO_a series, Pol_2 close to lateral line; PO, 5, PO_4 much elevated; VO, 4 or 5, on same level; AO, in two series, AO_a, 6 to 8, AO_p, 7 or 8; Prc, 4, first two on level with AO_p series, Prc_3 above and behind Prc_2, Prc_4 in contact with lateral line. Luminous organs: supracaudal, 3 to 5; infracaudal, 5 to 8. Colour: rich brown to black; dark on dorsal surface; light on ventral surface; dusky on fins.

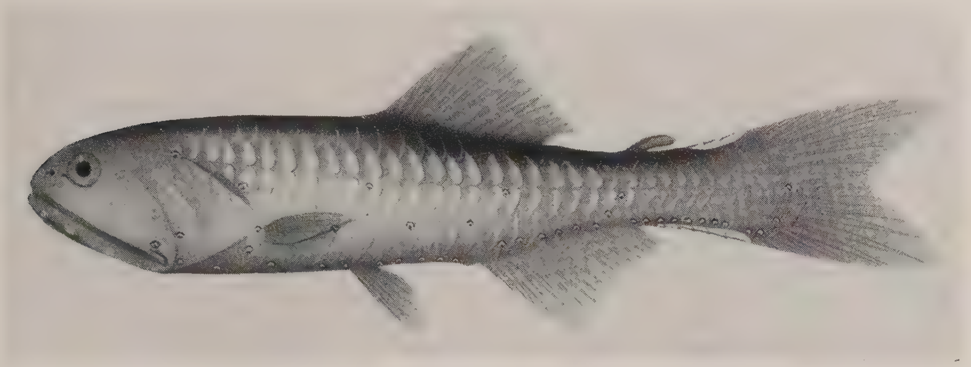

FIGURE 62. Small-eyed lantern fish. *Lampanyctus regalis* (Gilbert) 1891

Length to 6⅓ inches.

Distinguished by the elongate body, the small eyes, the minute flattened photophores on the body, the two posterolateral photophores on each side of the body and the fourth precaudal photophore on each side of the body in contact with the lateral line.

The small-eyed lantern-fish was first taken in British Columbia waters March 15, 1929, off Queen Charlotte sound by the International Fisheries Commission, station 183C, lat. 51° 47′ N., long. 131° 02′ W., depth between 379 and 487 fathoms, recorded in 1939 by W. M. Chapman as a new species, *Lampanyctus micropunctatus*, which is now known to be synonymous with *L. regalis* (Gilbert). There were ten other specimens taken by the Commission at ten other stations at depths ranging from 54 to 487 fathoms.

Range southern California to northwestern Alaska.

Suborder ALEPIDOSAUROIDEA

The fishes in this suborder range in size from about 7 inches to 5 feet and have long slender bodies. The mouth is large with numerous teeth, many strongly developed. Photophores are absent but luminous organs may be present.

Two families are represented along the British Columbia coast: Scopelarchidae and Alepidosauridae.

Family SCOPELARCHIDAE Scopelarchids

In the scopelarchids the body is small, moderately elongate, little compressed and covered with cycloid scales. The mouth is large with depressible fang-like teeth on lower jaw and palatines. The eyes are large, sometimes telescopic. The dorsal fin is small, well forward on the body. Luminous organs are sometimes present on the head.

The members of this family are all deep-sea fishes.

Pearl-eye *Neoscopelarchoides dentatus* Chapman 1939

Body elongate, slender. Head relatively short; mouth terminal, very large; maxillary reaching to point well behind eye; lower jaw projecting; teeth on upper jaw small, on lower jaw and palatines large, fang-like; eye moderately large, telescopic. Fins: dorsal (1), 6 or 7, small; adipose, slender, insertion above that of anal; anal, 17 to 21; pelvic, 9, abdominal, large; pectoral, 22 to 25, small, slightly longer than diameter of eye; caudal, emarginate. Lateral line: almost straight. Scales: cycloid; on lateral line, 56 to 58, enlarged. Photophores: absent. Luminous organs: on eyeball, 1, oval. Colour: brown on dorsal surface; lighter on ventral surface; in adults. Larval stages: translucent, almost transparent in abdominal region.

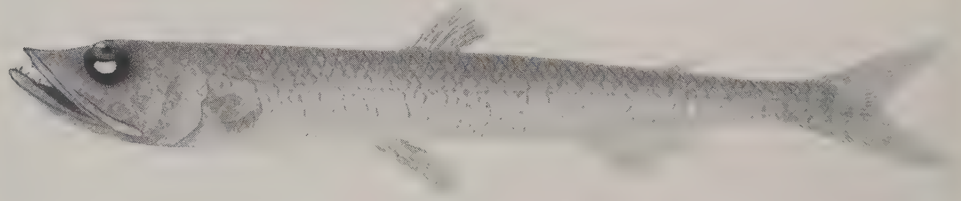

FIGURE 63. Pearl-eye. *Neoscopelarchoides dentatus* Chapman 1939

Length to 7 inches.

Distinguished by the elongate body, the telescopic eyes with the large oval luminous organs, the large mouth with the fang-like teeth on the lower jaw and the small pectoral and the large pelvic fins.

The pearl-eye was first taken in British Columbia waters March 10, 1929, off the west coast of Vancouver island near cape Scott by the International Fisheries Commission, station 172C, lat. 50° 43′ N., long. 129° 23′ W., in a vertical haul between 487 and 379 fathoms. This and six other specimens, obtained at six other stations during the next five years by the Commission, were recorded in 1939 by W. M. Chapman. The depths recorded were all between 54 and 488 fathoms.

Range west coast of Vancouver island to northwestern Alaska.

Family ALEPIDOSAURIDAE Lancet-fishes

In the lancet-fishes the body is large, elongate, greatly compressed and without scales. The mouth is large with many immovable fang-like teeth. The eyes are large, non-telescopic. The dorsal fin is very long and high. Luminous organs are absent.

The members of this family are all large, slender and very fragile. They inhabit the ocean depths and are known for the most part from specimens cast upon the shore.

Handsaw-fish *Alepidosaurus aesculapius* Bean 1882

Body elongate, slender, greatly compressed. Head greatly compressed; snout long; mouth terminal, widely cleft; maxillary reaching to margin of preopercle; teeth: on upper jaw numerous, minute, sharp; on lower jaw, 1, large, anterior, about 12 small, 4 large, followed by about 12 small to moderate, increasing in size posteriorly; on palatines very large, fang-like, 2 anterior, 1 posterior, eye very large; ridges on opercle, radiating, prominent. Fins: dorsal (1), 30 to 40, very long, high, rays depressible so that the whole fin may be folded down into a deep groove and thus become invisible; adipose, small; anal, 15 to 17,

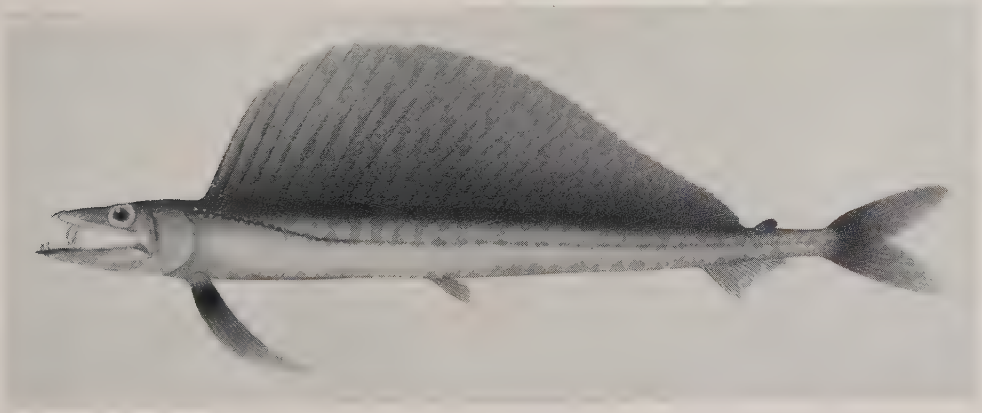

FIGURE 64. Handsaw-fish. *Alepidosaurus aesculapius* Bean 1882

small; pelvic, 8 or 9, abdominal; pectoral, long, length about equal to that of head; caudal, deeply furcate. Lateral line: high anteriorly, then almost straight. Scales: absent. Colour: dark gray to greenish brown on dorsal surface; silvery on sides, somewhat iridescent, with row of small translucent spots; dark streak along lateral line; black on dorsal fin with steel blue reflections; black on pectoral, adipose and caudal fins; silvery gray to dusky on pelvic and anal fins.

Length to 5 feet.

Distinguished by the long high dorsal fin, the presence of an adipose fin and the long fang-like teeth on the lower jaw and the palatine bones.

The handsaw-fish was first taken in British Columbia waters in September, 1896, in Quatsino sound by Mr. T. B. Norgate and the specimen was recorded in 1898 by J. Fannin as *Alepisaurus borealis* Gill and is in the collection of the Provincial Museum at Victoria. The species is captured occasionally along the Pacific coast from Washington to Alaska on halibut fishing gear, using herring for bait, and is sometimes cast up on shore after storms. Specimens have been secured near Victoria, in Quatsino sound off Triangle and Kains islands, near Butedale, off cape St. James, in Hecate strait and near Prince Rupert. The depths for the cape St. James and Hecate strait specimens were 170 and 140 fathoms respectively, while that of the Kains island individual was only 30 fathoms. The body is flaccid and the fins are fragile suggesting that this fish is an inhabitant of deep water. The food is somewhat varied. Individuals from halibut banks usually contain squid whose capture is evidently facilitated by the fang-like teeth. Other specimens have been found to contain spiny lump-suckers (*Eumicrotremus orbis*), the soft sculpin (*Gilbertidia sigalutes*) and herring.

Range southern California to northwestern Alaska.

Order APODES

In this order the body is extremely elongate. The maxillary bone forms the major portion of the upper jaw, the premaxillary not being evident because of fusion with other bones. The fins are supported by rays only. The dorsal and anal fins are very long, each usually continuous with a very small caudal fin which is sometimes reduced to a filament; the pelvic fins are absent in modern species. The scales, when present, are cycloid.

In those species in which the life history has been studied, as for example the true eel, *Anguilla*, and the conger, *Conger*, the larva is flattened, more or less leaf-shaped, and is known as a leptocephalus. The above mentioned genera do not occur on the coast of British Columbia.

Family NEMICHTHYIDAE Thread-fishes

This is a family of curious, exceedingly slender fishes with long, almost needle-like recurved jaws, the upper being somewhat the longer. The thread-fishes apparently inhabit fairly deep water but occasionally appear at the surface.

Snipe eel *Avocettina gilli* (Bean) 1890

Body very elongate, extremely slender, tapering posteriorly to sharp point; greatest depth about 40 in total length, near midlength. Head elongate, length about 8.2 in total length, flattened on top; mouth terminal, deeply cleft; jaws prolonged, very slender, flexible, recurved, upper jaw longer, each ending in pad covered with teeth; teeth on jaws and vomer, numerous, small, sharp, backward-slanting; eye small, diameter about 17 in length of head, not projecting into dorsal outline of head. Anus remote from head, distance behind more than 9 times length of pectoral fin. Fins: dorsal (1), about 260, extending practically full length of body; anal, about 205, shorter, origin immediately behind anus; pelvic, absent; pectoral, small; caudal, extremely small, short. Lateral line: pores in single row, about 156, large, open. Scales: absent. Colour: uniform black.

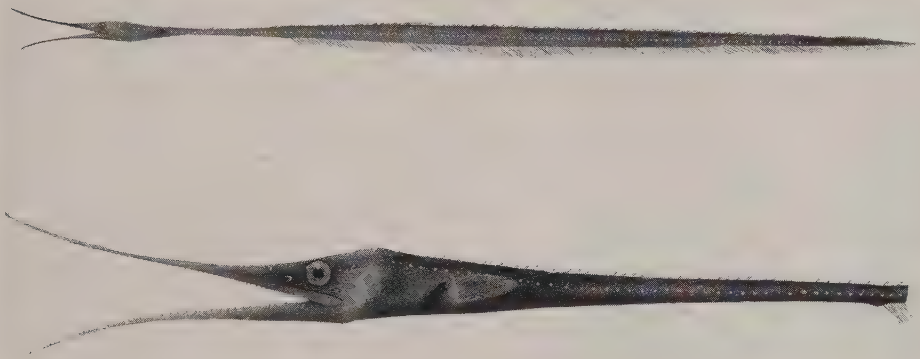

FIGURE 65. Snipe eel. *Avocettina gilli* (Bean) 1890

Length to 18 inches.

Distinguished by the extremely slender body without pelvic fins, the elongate recurved jaws, the anus remote from the head, the single row of pores on the lateral line and the small short caudal fin.

The snipe eel was first taken in British Columbia waters January 1, 1935, in Queen Charlotte sound by the International Fisheries Commission, station 1248A, lat. 51° 00′ N., long. 130° 48′ W., depth between 50 and 150 fathoms, approximately. Only a single specimen was obtained. It is the only one known from British Columbia waters and was recorded in 1940 by W. M. Chapman. The type specimen was secured east of Prince of Wales island, Alaska, at a depth of 1,569 fathoms.

Range northern British Columbia to southeastern Alaska.

Thread-fish *Nemichthys avocetta* Jordan and Gilbert 1880

Body very elongate, extremely slender, tapering very gradually from midlength, ending in filamentous projection; greatest depth about 60 in total length, near midlength. Head elongate, about 11 in total length, flattened on top; mouth terminal, deeply cleft; jaws prolonged, very slender, flexible, recurved, needle-like at tips, upper jaw longer; teeth on jaws and vomer numerous, small, sharp, backward-slanting; eye large, diameter about 13 in length of head. Anus near head, below pectoral fins. Fins: dorsal (1), about 330, extending practically full length of body, rays slender, basal portion of each strong, stiff, distal portion slender, delicate; anal, about 320, origin immediately behind anus; pelvic, absent; pectoral, small; caudal, absent. Lateral line: along midline. Pores: above, on and below lateral line, in 3 rows. Scales: absent. Colour: white on dorsal surface, unspotted; black on sides and ventral surface; white on dorsal fin, faintly black on margin; bluish black on margin of anal fin and tips of pectoral fins.

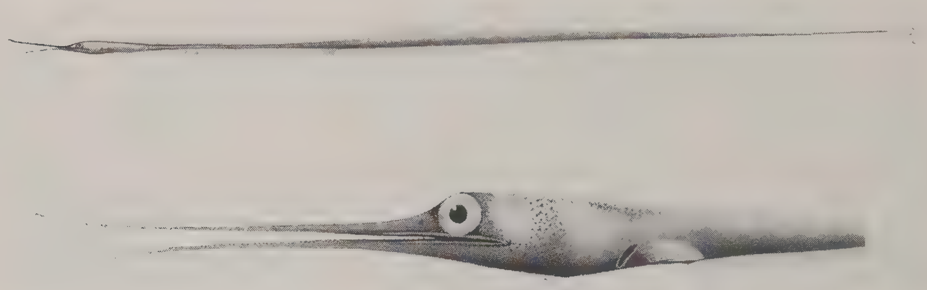

FIGURE 66. Thread-fish. *Nemichthys avocetta* Jordan and Gilbert 1880

Length to 2 feet 7½ inches.

Distinguished by the extremely slender body without pelvic fins, the elongate recurved jaws, the anus near the head, the three rows of pores along the lateral line, the body ending in an elongate filament and the reversed coloration of the body.

The thread-fish was first taken in British Columbia waters in 1894 when a specimen was found on the beach at Beacon hill, Victoria, by Mr. T. B. Norgate and recorded in 1898 by J. Fannin as being in the collection of the Provincial Museum at Victoria. A second individual was obtained from a herring-seine August 10, 1941, in Klemtu pass, near Butedale, by Mr. Emil Bostrom, at a depth of 16 fathoms, and the specimen is in the fish collection of the University of British Columbia. Other individuals are stated to have been observed by fishermen off the west coast of Vancouver island at various times. It appears occasionally at the surface and sometimes it is attracted at night to the surface by artificial light. Whether the reversed coloration of the thread-fish is the result of swimming upside down is not known but an African cat-fish (*Synodontus*), is known to do so and is brown to black on the ventral surface and pale silvery gray on the dorsal surface. The names brittle water-snake, glass-snake, avocet and thread-eel have been applied to this fish.

Range Oregon to northern British Columbia.

Order SYNENTOGNATHI

In this order the body is somewhat elongate and the head is pointed. The jaws are more or less produced in the non-flying forms. The fins are supported by rays only; the dorsal fin is placed far back on the body and is similar to and above the anal fin; the pelvic fins are abdominal. The lateral line is placed very low on the body. The scales are cycloid.

Family SCOMBERESOCIDAE Sauries

In the sauries the body is slender and "stream-lined." The jaws are prolonged to form a slender beak. There is a series of finlets behind both the dorsal and anal fins as in the mackerels.

These are fishes of the open seas, often occurring in large schools. They frequently leap out of the water, a habit which is highly developed in their close relatives, the flying-fishes.

Saury *Cololabis saira* (Brevoort) 1850

Body elongate, slender, slightly compressed; dorsal contour, in lateral view, straight from tip of snout to origin of dorsal fin. Head conical, flattened above; mouth terminal, slightly cleft; lower jaw somewhat projecting; teeth small, feeble; snout very pointed. Fins: dorsal (1), 9 to 11, far back on body, slightly behind vertical from origin of anal fin, followed by 5 or 6 finlets; anal, 12 to 14, followed by 5 to 7 finlets; pelvic, abdominal; pectoral, slightly emarginate; caudal, deeply furcate. Lateral line: very low, along side of ventral surface, extending to about fourth anal finlet. Scales: cycloid, small, thin, deciduous; in oblique rows above midline of body, 120 to 129. Colour: dark green on dorsal surface; silvery on ventral surface; pale on pelvic and anal fins; more or less dusky on other fins.

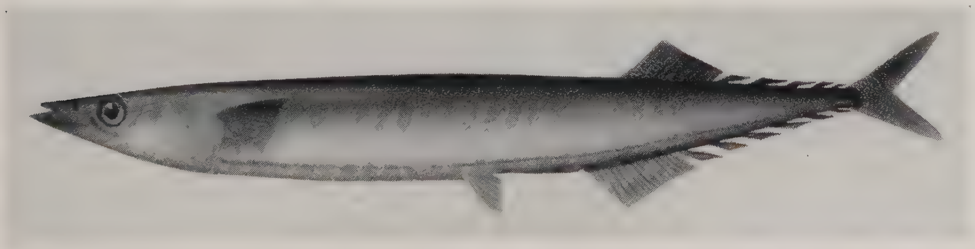

FIGURE 67. Saury. *Cololabis saira* (Brevoort) 1850

Length to 14 inches.

Distinguished by the single dorsal fin far back on the body, the finlets following both dorsal and anal fins, the pointed conical head with the projecting lower jaw and the low lateral line on each side of the body.

The saury was first taken in British Columbia waters off Vancouver island by C. H. Gilbert who obtained a specimen 10 inches in length and recorded it in 1915 as *Cololabis brevirostris* (Peters). Other specimens have been taken off the west coast of Vancouver island, in Queen Charlotte strait, in Queen Charlotte sound, in Hecate strait and in Massett inlet. The eggs possess short filaments and are pelagic. The young are undoubtedly pelagic also but little is known of the life history. The food is apparently plankton. Because of the habit of jumping out of the water this fish is sometimes referred to as the skipper.

Range southern California to southeastern Alaska.

Order GASTEROSTEI

In this order the head is pointed, sometimes much produced, the mouth is small with the premaxillary bone forming most of the margin of the upper jaw. The pelvic fins are thoracic with the pelvic girdle free from the pectoral girdle; there are two or more free spines representing the first dorsal fin. Bony pitted plates are usually present on the body.

Two families, the Gasterosteidae, sticklebacks, and the Aulorhynchidae, tube-snouts, are represented in British Columbia waters.

Family GASTEROSTEIDAE Sticklebacks

In the sticklebacks the body is somewhat elongate, stout, compressed, with a slender caudal peduncle. There are two dorsal fins, the first represented by free spines, fewer than 20 in number. The sides of the body are sometimes partially or completely covered with vertical oblong bony plates.

These are small fishes represented by five genera and about twelve species which inhabit the fresh and salt waters of North America, Europe and Asia.

Three-spined stickleback *Gasterosteus aculeatus* Linnaeus 1758

Body elongate, moderately compressed; caudal peduncle slender, sometimes with well developed lateral keels in marine forms. Head pointed; mouth terminal, moderate; teeth minute, sharp. Fins: dorsal (2), II or III—1, 11 or 12, spinous fin with 2 or 3 widely separated stout serrate spines, rarely spine in second fin absent; anal, I—8 or 9, spine short; pelvic, I, 1, thoracic, spine large, serrate, ray small, fins below interspace between first and second spines of spinous dorsal fin; all spines may be locked rigidly in their sockets to stand out from body at right angles, thus forming a very effective armour; pectoral, truncate, origin some distance behind gill opening; caudal, slightly furcate. Lateral line: high, following dorsal contour, pores microscopic. Plates: large, bony, oblong, vertical, in series along side of body in marine individuals, greatly reduced in brackish-water individuals, almost completely absent in fresh-water individuals. Bony plate formed by fusion of pelvic girdle parts, elongate, triangular, on ventral surface of body between and behind pelvic fins. Colour: variable; silvery green to intensely bluish black in marine, mottled brown in fresh-water specimens; bright silvery in young.

Length to 4 inches.

Distinguished by the large spines in the dorsal and pelvic fins, the slender caudal peduncle and the vertical bony plates on the sides of the body.

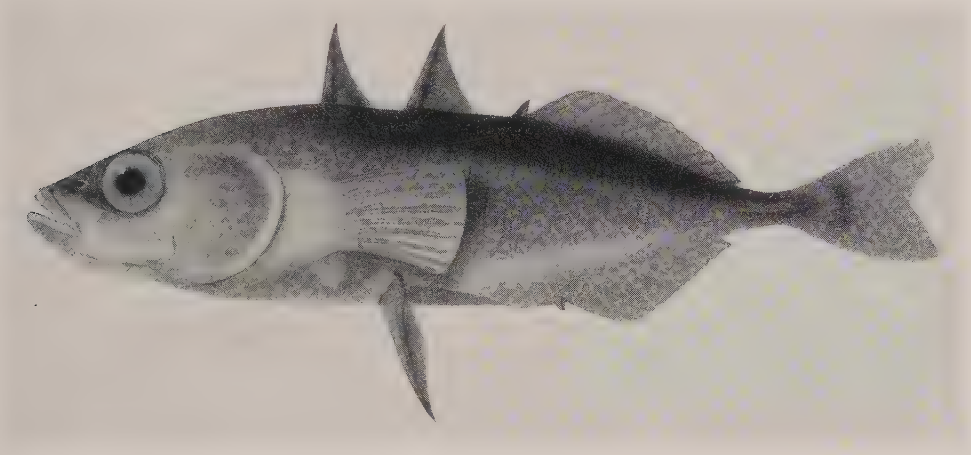

FIGURE 68. Three-spined stickleback. *Gasterosteus aculeatus* Linnaeus 1758

The three-spined stickleback was first recorded from British Columbia waters in 1866 by J. K. Lord as *Gasterosteus serratus* and *G. concinnus*, without definite locality stated. The first locality record was that of a specimen taken in June, 1882, near Duncan bay, collected by Capt. H. E. Nichols and recorded in 1883 by T. H. Bean as *Gasterosteus cataphractus* Pallas. The species is common along the whole coast and in the various streams and lakes. It occurs frequently in small schools, particularly in eel-grass and around wharves. The habit of remaining stationary with the tail bent is a characteristic posture. Specimens have been found in the stomachs of fur-seals obtained 20 miles off the west coast of Vancouver island and one specimen, entirely bluish black in colour, was taken in July, 1941, in northern British Columbia at Laredo inlet in a herring-seine at a depth of 15 fathoms. The spawning activities of this fish in fresh water are of interest in that the male constructs a rather elaborate nest, induces one or more females to spawn therein and then guards the nest and its eggs until the fry have left to forage for themselves. The classic description of these activities is to be found in *The naturalist in Vancouver island and British Columbia*, by J. K. Lord, published in 1866. The food of this stickleback in the sea consists largely of small crustaceans but in fresh water aquatic insects are taken in addition. In spite of the spines, the stickleback is readily eaten by other fishes and waterfowl.

Range southern California to northwestern Alaska.

Family AULORHYNCHIDAE Tube-snouts

In the tube-snouts the body is elongate, slender and almost cylindrical with a slender caudal peduncle. The head is prolonged into a peculiar snout with a very small mouth at the end, with a hinged upper jaw. There are two dorsal fins, the first represented by free spines, about 25 in number. The body is partially covered with rows of small bony plates.

There is only one species in the family, confined to the northwestern Pacific ocean.

Tube-snout *Aulorhynchus flavidus* Gill 1861

Body very elongate, slender, terete; caudal peduncle elongate, tapering, depressed. Head elongate; snout elongate, tubular, depressed; mouth terminal, small; lower jaw flattened, projecting slightly beyond upper; premaxillaries enlarged, hinged, freely movable; teeth small, recurved; eye, large. Fins: dorsal (2), about XXV—9 or 10, spinous fin represented by minute, free, sharp spines; rayed fin far back on body; anal, I, 9, spine minute, broad; pelvic, I, 4, thoracic; pectoral broad, truncate; caudal, furcate. Lateral line: straight. Plates: small, bony, embedded; in series along mid-dorsal line; in series along lateral line; in paired series along mid-ventral line on caudal peduncle. Colour: usually pale mottled brown, varying from light olive green to yellow brown on dorsal surface; pale creamy white on ventral surface.

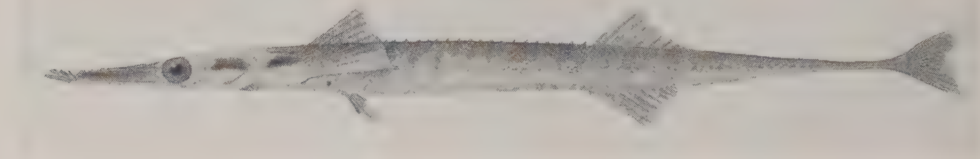

FIGURE 69. Tube-snout. *Aulorhynchus flavidus* Gill 1861

Length to 6½ inches.

Distinguished by the very elongate terete body, the prolonged tubular snout with the small mouth at the tip and the numerous minute free spines preceding the rayed dorsal fin.

The tube-snout was first recorded from British Columbia waters in 1866 without date or locality by J. K. Lord as *Gasterosteus spinachia*. The first definite locality record is that of a specimen 5½ inches in length taken May 12, 1893, in the Queen Charlotte islands at Massett by Mr. J. H. Keen and recorded in 1920 by B. A. Bean and A. C. Weed. The species is common in the strait of

Georgia and has been reported from the west coast of Vancouver island. The tube-snout is a common shore fish, often appearing in small schools at the surface of the water around wharves, swimming slowly with fins moving rapidly and jaws snapping constantly. It is obtained frequently with the pipe-fish in shore-seines, especially around eel-grass beds. The food consists of small plankton crustaceans.

Range southern California to southeastern Alaska.

Order SOLENICHTHYES

In this order the body is usually elongate. The snout is prolonged into a more or less elongate and tube-like "beak" at the extreme end of which is placed a small mouth. Teeth usually are absent and when present are exceedingly small.

Six families comprise the order, all of which are found in tropical or temperate seas, generally living near the shore and sometimes entering fresh water. Only one of these, the Syngnathidae, is represented in British Columbia waters and comprises the pipe-fishes and sea-horses.

Family SYNGNATHIDAE Pipe-fishes

In the pipe-fishes the body is elongate, slender and is enclosed in an armour of bony plates which form a series of encircling rings. There is a single rayed dorsal fin; the pelvic fins are absent.

The pipe-fishes and sea-horses swim in a more or less upright position, propelling themselves partly by the dorsal fin and partly by wriggling movements of the body. The care of the eggs and also of the fry is undertaken by the male. It is unfortunate that the picturesque sea-horse does not occur in British Columbia waters.

Pipe-fish *Syngnathus griseo-lineatus* Ayres 1854

Body elongate, very slender, subcylindrical, 6-angled anteriorly, 4-angled posteriorly. Head elongate; snout elongate, tubular, almost cylindrical, slightly longer in female; mouth terminal, small; upper and lower jaws united by membrane; teeth absent. Sexes very different in appearance; in female, body anterior to anus moderately stout of slightly greater length than that of male, posterior to anus slender and tapering to origin of caudal fin; in male, body posterior to anus expanded into pair of lateral folds forming longitudinal brood pouch, about one-third of total body length, edges of folds meeting on midline below. Fins: dorsal (1), 36 to 41, short, approximately at middle of body in female, slightly forward in male; anal, minute in female, immediately behind anus, absent in male: pelvic, absent; pectoral, small; caudal, small, fan-shaped. Lateral line: absent. Bony plates on body: in rows, 6 anteriorly (dorsal, 1, ventral, 1, lateral, 4), 4 posteriorly, lateral. Colour: variable, from pale olive green to dark green or brown, according to environment; frequently pale olive green with narrow horizontal gray lines.

Length to 13 inches in females, slightly less in males.

Distinguished by the elongate subcylindrical angular body enclosed in bony plates, the tubular mouth and snout and the absence of pelvic fins.

The pipe-fish was first recorded from British Columbia waters in 1866 by J. K. Lord as *Syngnathus arundinaceus*. The first definite locality record is that of a specimen taken in 1885 in the strait of Georgia by Dr. G. M. Dawson and recorded in 1887 by J. F. Whiteaves as *Siphostoma Caiforniense* Storer (evidently a misprint for *californiense*). The pipe-fish is very common in the strait of Georgia and has been recorded from the west coast of Vancouver island, Loughborough inlet and the Queen Charlotte islands. Occurring along the shores, amongst eel-grass and about wharves, it swims slowly in a jerky manner often maintaining an almost vertical position in the water. The reproductive period is in the spring. Males have been found carrying eggs as early as May 26, and young as late as August. The female transfers the fertilized eggs to the brood pouch of the male where they are incubated and the young remain therein until they reach a length of about ¾ of an inch. The food consists largely of small crustaceans and is taken into the tubular mouth by a sucking movement accompanied by an inflation of the cheeks.

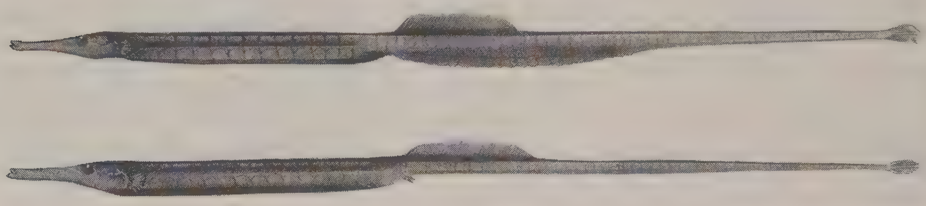

FIGURE 70. Pipe-fish. *Syngnathus griseo-lineatus* Ayres 1854

Range southern California to southeastern Alaska.

Order ANACANTHINI

In this order the body is elongate and deep anteriorly, covered with cycloid scales. The fins are soft rayed; the dorsal fins are long and may be divided into two or more separate fins; the pelvic fins are thoracic with the pelvic girdles attached to the cleithra by means of ligaments; the apparent caudal fin, when present, is composed mainly of dorsal and anal fin rays but herein is referred to as a caudal fin. There is frequently a barbel near the tip of the lower jaw.

Three families are represented in British Columbia waters: Merlucciidae, hakes; Gadidae, cods; and Macruridae, grenadiers.

Family MERLUCCIIDAE Hakes

In the hakes the mouth is large with the lower jaw projecting. There is no barbel. The frontal bones are separated and possess ridges which diverge from the occipital crest and border a large triangular depression. The second dorsal fin and the anal fin are deeply notched.

Hake *Merluccius productus* (Ayres) 1855

Body elongate, moderately compressed. Head large; mouth terminal, large; lower jaw projecting; maxillary extending to point below pupil of eye; teeth on jaws slender, canine-like, strong, in two bands, on vomer in bands; snout long, flattened above; eye large, diameter 4 or more in length of head, high, upper margin level with top of head; ridges on top of head: 3, frontal, 2, diverging; occipital, 1, median. Fins: dorsal (2), 10 or 11—41, first short, second long, deeply notched; anal (1), 40 to 43, deeply notched; pelvic, 6 to 8, thoracic; pectoral, long, tip reaching to anal; caudal, truncate. Lateral line: moderately decurved, then nearly straight. Scales: cycloid, very small, deciduous. Colour: dull silvery gray; black speckling on dorsal surface; brown on pectoral fins; jet black on inside of mouth and opercles.

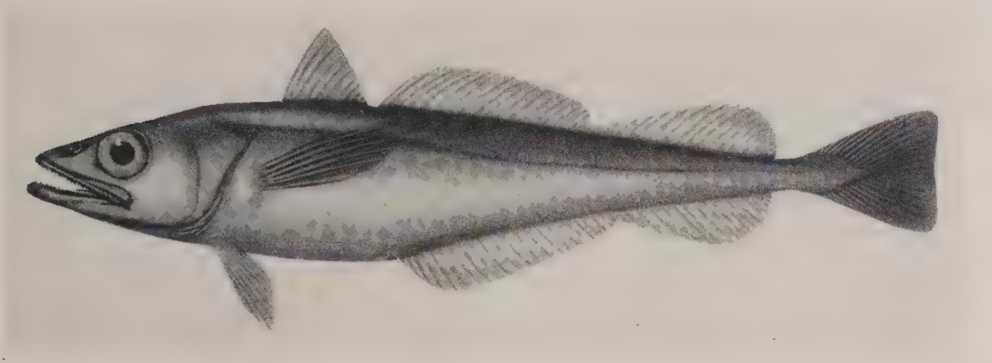

FIGURE 71. Hake. *Merluccius productus* (Ayres) 1855

Length to 3 feet.

Distinguished by the two dorsal fins, the first short, the second long and deeply notched, the large mouth with the protruding lower jaw, the large eyes and the ridges on the top of the head.

The hakes was first taken in British Columbia waters in 1885 near Gabriola island by Dr. G. M. Dawson and recorded in 1887 by J. F. Whiteaves as *Merlucius productus* Ayres (evidently a misprint for Merluccius). It is common along the whole coast. This fish is a frequent source of annoyance to the salmon fishermen at the mouth of the Fraser river as it gills in their nets, particularly at night. The young are captured occasionally in shrimp trawls at depths of 50 fathoms and more. Off the California coast the hake has been reported from 491 fathoms. The food consists of small fishes and squids. Because of the soft flesh and lack of flavour the hake seldom reaches the markets.

Range southern California to northwestern Alaska.

Family GADIDAE Cods

In the cods the mouth is terminal with the lower jaw projecting or included or is subterminal. A barbel is usually present at the tip of the lower jaw but it may be minute or absent in some forms. The frontal bones are united without ridges. The dorsal and anal fins are variously divided.

The members of this family are mostly fishes of the colder waters and constitute one of the most important commercial groups In the north Pacific area occur the cod, whiting, tomcod and long-finned cod. These are represented in the north Atlantic by closely related species and in addition there occur the haddock, pollack, and several other species of lesser economic value. There is one fresh-water member of the family, namely the ling (burbot, lawyer, or loche), which occurs in the larger lakes and streams across North America as well as across northern Asia and Europe.

It might be well to point out that several fishes in the Pacific have erroneously been called "cods" such as: the rock-fishes (rock cods), Scorpaenidae; the greenlings (tommy-cod), Hexagrammidae; the sable-fish (black cod), *Anoplopoma fimbria;* the lingcod (cultus cod), *Ophiodon elongatus.* None of the above fishes is in any way related to the true cod, *Gadus*, and it would be advisable to suppress the common names given in brackets.

Whiting *Theragra chalcogramma* (Pallas) 1811

Body elongate, moderately compressed. Head pointed; mouth terminal, moderate; lower jaw slightly projecting; teeth on jaws villiform, outer row on upper jaw slightly enlarged; eye moderately large, diameter 3.3 to 4.7 in length of head; barbel on lower jaw, absent or minute. Anus below interspace between first and second dorsal fins. Fins: dorsal (3), 10 to 13—12 to 18—14 to 20, well separated; anal (2), 15 to 22—15 to 21; pelvic, 6 or 7, thoracic; caudal, concave.

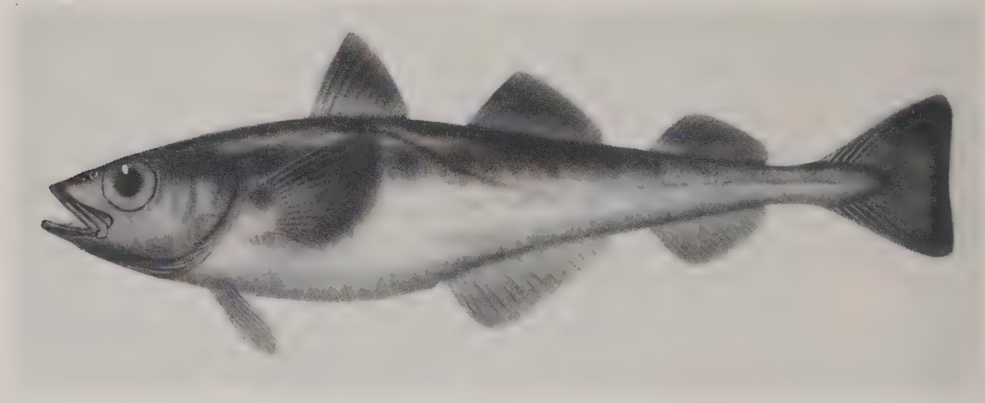

FIGURE 72. Whiting. *Theragra chalcogramma* (Pallas) 1811

Lateral line: high anteriorly, then straight. Scales: cycloid, small. Colour: olive green to brown on dorsal surface, frequently blotched or mottled; silvery on sides; lighter on ventral surface; dusky to black on fins; in young, two narrow light yellow bands along sides, occasionally short third band.

Length to 3 feet.

Distinguished by the three dorsal fins, the projecting lower jaw, the position of the anus below the interspace between the first and second dorsal fins and the minute barbel on the lower jaw, when present.

The whiting was first taken in British Columbia waters August 2, 1881, at the head of Kingcome inlet by Capt. H. E. Nichols, and recorded in the same year by T. H. Bean as *Pollachius chalcogrammus* (Pallas). It occurs abundantly along the coast and is taken in waters of moderate depth where it feeds upon crustaceans of the plankton. Considerable quantities are caught in seines and trawls and find a ready market. While the name Alaska pollack has been used for this species, the term whiting is just as appropriate and since the fishermen know the fish under the latter name its adoption seems advisable. It should be pointed out that the whiting of Great Britain is not the same species, although belonging to the cod family. The northern and southern individuals of the Pacific coast differ somewhat in the numbers of fin rays and have been given subspecific names. Those of northern British Columbia and Alaska have the higher fin ray counts and are referred to as *T. chalcogramma chalcogramma*, while those of southern British Columbia and Washington have the lower fin ray counts and are referred to as *T. chalcogramma fucensis*. Undoubtedly intergrading forms occur along the coast of British Columbia.

Range northern California to northwestern Alaska.

Tomcod *Microgadus proximus* (Girard) 1854

Body elongate, slender, moderately compressed. Head elongate, convex above; mouth terminal, moderate; lower jaw included; teeth on jaws, villiform, outer row on each jaw slightly enlarged; eye moderately small, diameter about 5 in length of head; barbel on lower jaw small, length about 2 in diameter of eye. Anus below first dorsal fin. Fins: dorsal (3), 11 to 14—17 to 20—18 to 20, slightly separated; anal (2), 20 to 25—18 to 21; pelvic, 6 or 7, thoracic; caudal, truncate or slightly concave. Lateral line: high anteriorly, then straight. Scales: cycloid, small. Colour: olive green on dorsal surface; creamy white on ventral surface; dusky on tips of dorsal, pectoral, second anal and caudal fins.

Length to 12 inches.

Distinguished by the three dorsal fins, the position of the anus below the first dorsal fin and the small barbel on the lower jaw.

The tomcod was first taken in British Columbia waters in 1885 at Alert bay at a depth of 10 fathoms by Dr. G. M. Dawson and recorded in 1887 by J. F. Whiteaves as *Gadus proximus* Ayres. It occurs along the whole coast and appears in small quantities on the local markets, being taken by otter and shrimp trawls at depths ranging from 15 to 50 fathoms. The tomcod apparently is much less abundant than the whiting.

Range northern California to northwestern Alaska.

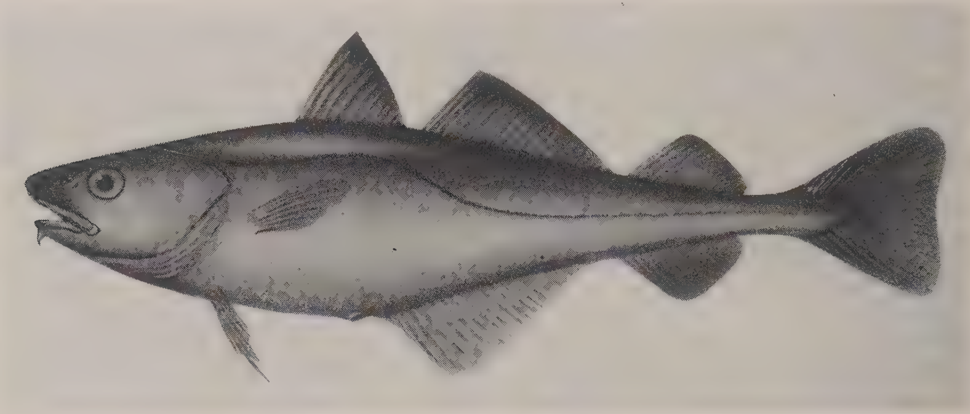

FIGURE 73. Tomcod. *Microgadus proximus* (Girard) 1854

Cod *Gadus macrocephalus* Tilesius 1810

Body elongate, stout, moderately compressed. Head large; snout blunt; mouth terminal, moderate; lower jaw included; teeth on jaws cardiform, outer row on each jaw much enlarged; eye small, diameter about 6 in length of head; barbel on lower jaw long, at least as long as diameter of eye, longer in adults. Anus below second dorsal fin. Fins: dorsal (3), 11 to 14—14 to 21—14 to 20, well separated; anal (2), 16 to 24—14 to 19; pelvic, 6 or 7, thoracic; caudal, truncate or slightly concave. Lateral line: high anteriorly, then straight. Scales: cycloid, small. Colour: brown to gray on dorsal surface; lighter on ventral

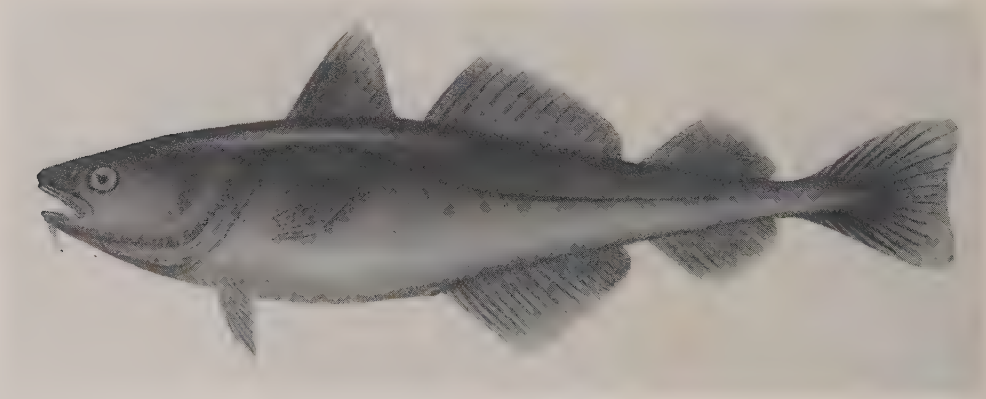

FIGURE 74. Cod. *Gadus macrocephalus* Tilesius 1810

surface; brownish spots numerous on back and sides; more or less dusky on fins; white on outer margins of all vertical fins, wider on anal and caudal fins.

Length to 3 feet 3 inches.

Distinguished by the three dorsal fins, the position of the anus below the second dorsal fin and the long barbel on the lower jaw.

The cod was first taken in British Columbia waters July 27, 1881, at Quadra island in Drew harbour, by Capt. H. E. Nichols, and recorded in the same year by T. H. Bean as *Gadus morrhua* Linn. A specimen taken in 1903 off Fort Rupert, at *Albatross* station 4202, was recorded as *Eleginus navaga* (Kölreuter) by B. W. Evermann and E. L. Goldsborough but was subsequently shown by L. P. Schultz and A. D. Welander in 1935 to be a *Gadus macrocephalus*. The species is common along the whole coast, particulary in the north. It is the true cod of the Pacific, resembling the Atlantic species, *G. morrhua*, very closely in appearance and habits. There appears to be something of a migration from deep to shallow water at certain seasons of the year. Specimens have been taken at depths of 130 fathoms as well as in shallow water around wharves. Spawning takes place in winter and early spring and undoubtedly the eggs are pelagic as are those of the Atlantic cod. Apparently feeding takes place near or at the bottom, the food consisting largely of fishes, of which herring and sand-lances form a considerable proportion, as well as various crustaceans. It is captured frequently on halibut gear and in trawls and marketed as fresh fish in the round or as fillets but a small quantity is smoked or drysalted. The cod is an excellent food product if after capture it is dressed immediately and iced with a minimum of handling.

Range Oregon to northwestern Alaska.

Long-finned cod *Antimora rostrata* Günther 1878

Body elongate, tapering considerably posteriorly, moderately compressed. Head pointed, compressed; snout acute, small sharp protuberance on tip in some specimens; mouth subterminal, large; teeth small, villiform; eye large, diameter 3.6 to 4.5 in length of head (about 3 in small specimens); barbel on lower jaw, long. Fins: dorsal (2), 4 or 5—50 to 55, first very short, first ray greatly elongate, second fin long, low; anal (1), 39 to 42, deeply notched; pelvic, 6 or 7, thoracic, first ray greatly elongate; caudal, truncate to emarginate. Lateral line: slightly decurved, then straight. Scales: cycloid, small. Colour: pale bluish gray to olive green.

Length to 21 inches.

Distinguished by the presence of two dorsal fins, the first short, the second very long, the single deeply notched anal fin and the short acutely rounded snout resembling that of a grenadier.

The long-finned cod was first taken in British Columbia waters August 29, 1888, when two specimens were obtained near cape St. James by the *Albatross*, station 2860, lat. 51° 23′ N., long. 130° 34′ W., depth 876 fathoms. The only subsequent capture is that of a specimen secured September 3, 1890, west of

Moresby island, *Albatross* station 3342, depth 1,588 fathoms. These fish were considered by T. H. Bean to constitute a new species, *Antimora microlepis*, and he recorded them as such in 1890. This species was subsequently shown by W. C. Schroeder to be synonymous with *A. rostrata* Günther of the Atlantic. The long-finned cod is a deep-water species and probably will only be taken by scientific expeditions such as that of the *Albatross*.

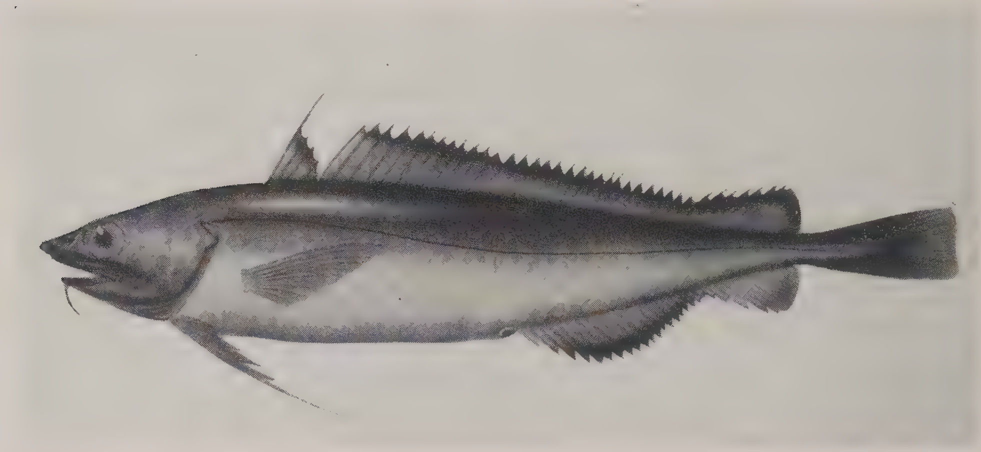

FIGURE 75. Long-finned cod. *Antimora rostrata* Günther 1878

Range southern California to northwestern Alaska.

Family MACRURIDAE Grenadiers

In the grenadiers the body is deep anteriorly and tapers very gradually to a point. The head is large, with a prominent suborbital ridge. The mouth is subterminal and a barbel usually is present. There are two dorsal fins, the first short and high, the second very long and low; the anal fin is similar to the second dorsal but usually has longer rays; the caudal fin is absent; the pelvic fins have the outer ray greatly elongate.

This is a large family of deep-water fishes of wide distribution. The term rat-tails is sometimes applied to the members of this group.

Smooth-scaled grenadier *Dolloa cyclolepis* (Gilbert) 1895

Body elongate, stout anteriorly, tapering to point posteriorly. Head large, compressed, smooth; snout pointed, projecting beyond premaxillaries; mouth subterminal, small; teeth on upper jaw in two rows, outer small, inner smaller, pointing backward, on lower jaw in one row; eye small, diameter about 5 in length of head; barbel on lower jaw short, about 1.5 in length of snout. Anus below interspace between dorsal fins. Fins: dorsal (2), 10 or 11 (ray count of second dorsal, unknown), first fin short, high, first two rays stiff, first elongate, minutely spinous, second fin very long, low, inconspicuous, interspace longer than length of base of first dorsal fin; anal (ray count, unknown), long, low; pelvic, 12, thoracic; caudal, absent. Lateral line: decurved, then straight. Scales: cycloid, small, keeled, spinules few or absent. Colour: dark brown on dorsal surface; black on ventral surface; black dots scattered over anterior of back and sides; black on lower side of head, opercles, gill membranes, lining of mouth and peritoneum.

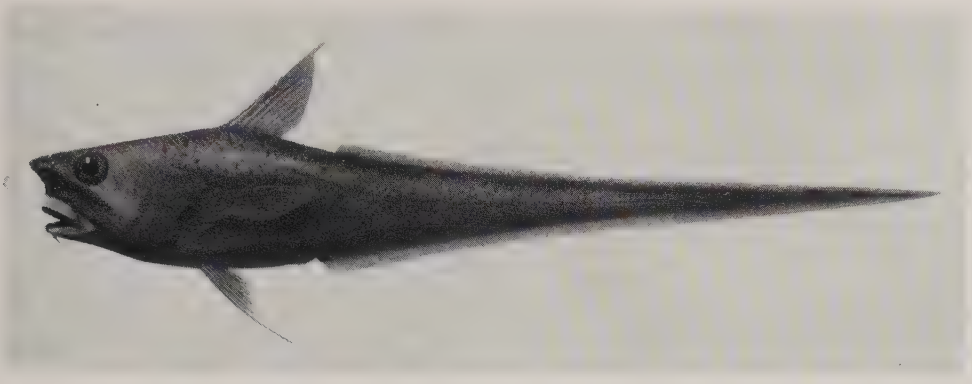

FIGURE 76. Smooth-scaled grenadier. *Dolloa cyclolepis* (Gilbert) 1895

Length to 6 inches.

Distinguished by the absence of a caudal fin, the presence of a barbel on the lower jaw, the interspace between the dorsal fins longer than the base of the first dorsal fin and the anus below the interspace between the dorsal fins.

The smooth-scaled grenadier is known from two specimens taken September 3, 1890, west of Moresby island by the *Albatross*, station 3342, lat. 52° 39′ N., long. 132° 38′ W., depth 1,588 fathoms. One of these is the type which was described in 1895 by C. H. Gilbert as *Nematonurus cyclolepis* and deposited in the United States National Museum.

Range off the Queen Charlotte islands.

Filamented grenadier *Chalinura filifera* Gilbert 1895

Body elongate, stout anteriorly, tapering to point posteriorly. Head large, compressed, rough; snout pointed, projecting beyond premaxillaries; mouth subterminal, large; teeth on upper jaw in villiform band, in outermost row enlarged; on lower jaw in one row, large; eye moderate, diameter about 4 in length of head; barbel on lower jaw short, 2 to 2.5 in length of snout. Anus below second dorsal fin. Fins: dorsal (2), 14 to 16 (ray count of second dorsal, unknown), first fin short, high, second ray elongate, slender, smooth at base, strongly spinous on upper half, second fin very long, low, inconspicuous, interspace more than half length of base of first dorsal fin; anal (ray count, unknown), long, low; pelvic, 9 or 10, thoracic; caudal, absent. Lateral line: decurved, then straight. Scales: cycloid, small, spinules numerous, short, rigid. Colour: dark brown; black on fins, nostrils, ventral surface of snout, lips and gill membranes.

Length to 22½ inches.

Distinguished by the absence of a caudal fin, the presence of a short barbel on the lower jaw, the interspace between the dorsal fins more than half the length of the base of the first dorsal fin, the anus below the second dorsal fin, the 14 to 16 rays in the first dorsal fin and the 9 or 10 rays in the pelvic fin.

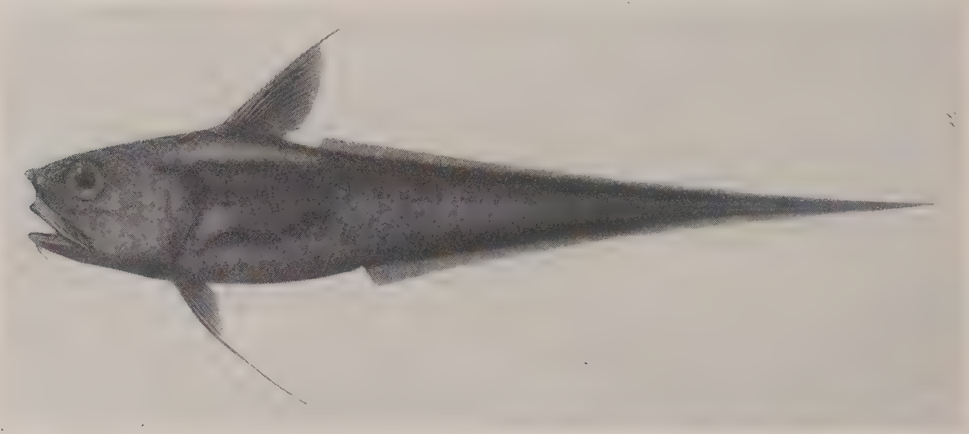

FIGURE 77. Filamented grenadier. *Chalinura filifera* Gilbert 1895

The filamented grenadier is known from three specimens taken September 3, 1890, west of Moresby island by the *Albatross*, station 3342, lat. 52° 39′ N., long. 132° 38′ W., depth 1,588 fathoms. One of these is the type which was described in 1895 by C. H. Gilbert and deposited in the United States National Museum.

Range off the Queen Charlotte islands.

Rough-scaled grenadier *Macrurus acrolepis* Bean 1883

Body elongate, stout anteriorly, tapering to point posteriorly. Head large, compressed, rough; suborbital ridge prominent; snout pointed, projecting beyond premaxillaries; mouth subterminal, moderate; teeth on both jaws in villiform bands, those on outer series not enlarged; eye large, diameter about 3.5 in length of head; barbel on lower jaw long, about equal to length of snout. Anus below second dorsal fin. Fins: dorsal (2), 11 to 13—111 + , first fin short, high, first ray very short, second elongate, spinous; second fin very long, low, inconspicuous, interspace less than half length of base of first dorsal fin; anal, 94 + , long, low; pelvic, about 10, thoracic; caudal, absent. Lateral line: decurved, then straight.

Scales: cycloid, small, keeled, spinules numerous, short, rigid. Colour: dark brown to black on dorsal surface; lighter on ventral surface.

Length to 2½ feet.

Distinguished by the absence of a caudal fin, the presence of a long barbel on the lower jaw, the interspace between the dorsal fins less than half the length of the base of the first dorsal fin and the anus below the second dorsal fin.

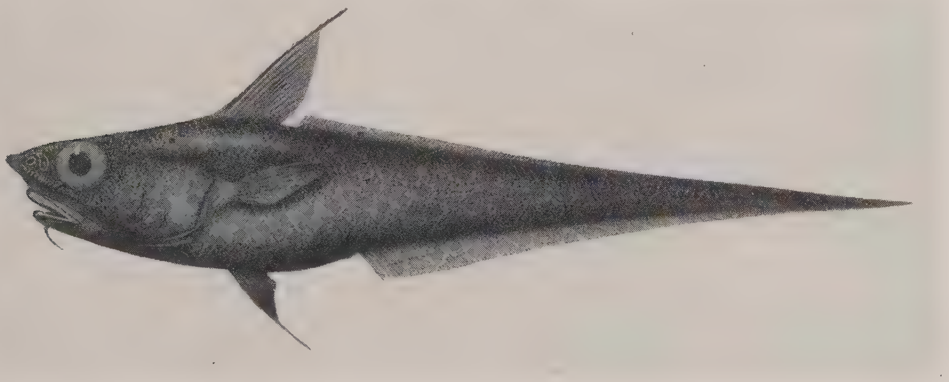

FIGURE 78. Rough-scaled grenadier. *Macrurus acrolepis* Bean 1883

The rough-scaled grenadier was first taken in 1882 by Mr. J. G. Swan who discovered a specimen in the stomach of a fur-seal captured in Juan de Fuca strait off Neah bay and landed at Port Townsend. This is the type which was recorded in 1883 by T. H. Bean and deposited in the United States National Museum. The record is included here as the fish may well have been caught in the waters north and west of the International boundary line. In 1895 this species was recorded by C. H. Gilbert who said that it was common off Vancouver island. Records from areas outside of Canadian waters indicate a range of depths from 345 to 1,217 fathoms.

Range southern California to northwestern Alaska.

Order ALLOTRIOGNATHI

In this order the body varies from deep ovate to elongate slender. The fins are soft-rayed; the pelvic fins, when present, are thoracic; the dorsal fin is long and usually high anteriorly; the pectoral fins have their bases horizontal. The mouth is protrusible through the action of the protractile premaxillary and maxillary bones.

The diversity of shape, structure and size of the various fishes in this group is amazing as shown by the large oval compressed body of the opah, the long, slender, ribbon-like form of the king-of-the-salmon and the bizarre 11-inch very slender *Stylophorus* of the Atlantic depths with extremely protractile jaws, telescopic eyes and whip-like caudal appendage almost twice the length of the body.

Two families are represented in British Columbia waters, Lampridae and Trachypteridae.

Family LAMPRIDAE Moon-fishes

There is but a single species in this family, the opah or moon-fish, which occurs in all seas. It is remarkable because of the size attained, the deeply ovate body and the brilliant coloration.

Opah *Lampris regius* (Bonnaterre) 1788

Body ovate, deep, much compressed; caudal peduncle short, slender. Head deep, compressed; mouth terminal, moderate; maxillary protractile; teeth, absent; eye, large. Fins: dorsal (1), 48 or 49, high, falcate anteriorly, low posteriorly; anal, 33 or 34, long, low; both dorsal and anal fins depressible into deep grooves;

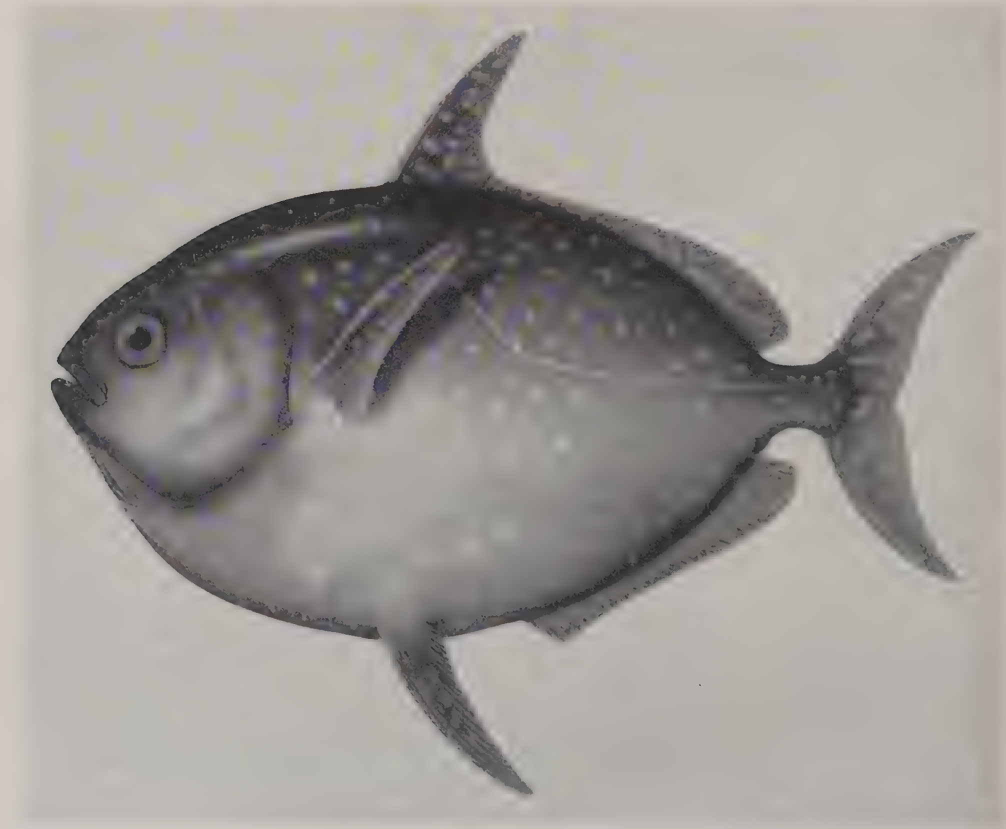

FIGURE 79. Opah. *Lampris regius* (Bonnaterre) 1788

pelvic, 14 to 17, thoracic, long; pectoral, 20 to 22, long, falcate; caudal, broadly lunate. Lateral line: very highly arched above pectoral fin, straight posteriorly. Scales: cycloid, minute. Colour: steely blue to dark bluish gray on dorsal surface, shading to silver flushed with rose red on ventral surface; white or silvery spots numerous, round; white on lateral line; golden around eyes; vermilion on jaws and fins, white mottling on dorsal and caudal fins.

Length to 6 feet.

Distinguished by the deep, ovate, much compressed body, the dorsal fin high and falcate in front, the silvery spotting and the brilliant coloration.

The opah was first taken in British Columbia waters August 25, 1935, off the west coast of Vancouver island 20 miles south of Lennard light on a brass salmon-spoon at about 10 fathoms below the surface. It was recorded anonymously the same year as *Lampris luna*, which name should be replaced by *Lampris regius*. Two other specimens taken in July, 1936, off Kyuquot and in September, 1937, near cape Beale were recorded in 1938 by I. McT. Cowan as *Lampris luna* (Gmelin). A number of other individuals have been reported since from time to time from the same general area. This fish is an inhabitant of the open waters, usually of the warmer seas, and is of world-wide distribution. The species attains a very large size and weights of 500 and 600 pounds have been recorded. It is one of the most beautifully coloured of marine fishes. The food consists of crustaceans, squid and small fishes. The flesh is salmon red of various shades, oily, and is said to be of excellent flavour and is used for food in Europe and Japan. Various names other than opah have been applied to this fish such as: moon-fish, mariposa, Jerusalem haddock, etc.

Range southern California to northwestern Alaska.

Family TRACHYPTERIDAE Ribbon-fishes

In the ribbon-fishes the body is long ribbon or band-shaped and extremely flexible because of the weakly ossified skeleton. The caudal fin is divided into two portions, the upper large, fan-shaped, the lower present in the young, usually disappearing in the adult; the anal fin is absent.

While these are evidently deep-sea fishes, occasionally individuals are observed swimming at the surface of the water and specimens are sometimes found washed up on shore.

Fishermen in various parts of the world have considered them as more or less sacred, believing that if harmed such schooling fishes as herring and salmon leaving the fishing ground, hence such names as, king-of-the-herring and king-of-the-salmon have been given to these fishes.

King-of-the-salmon *Trachypterus rex-salmonorum* Jordan and Gilbert 1894

Body elongate, greatly compressed, ribbon-like. Head pointed, profile steep, nearly straight; mouth terminal, small; maxillary very broad, protractile; teeth on jaws few, canine-like. Fins: dorsal (1), 166 to 188, first 5 rays greatly elongate;

anal, absent; pelvic, 6, thoracic, elongate, sometimes absent in large individuals; pectoral, very small; caudal, 13, asymmetrical, upper lobe developed into large fan-shaped structure directed obliquely upward from end of caudal peduncle, supported by 8 rays, lower lobe supported by 5 rays, fourth extremely elongate in young. Lateral line: straight. Scales: in form of pad-like tubercles; on lower portion of body, numerous, small, conical; on lateral line, conical, spinous, more numerous posteriorly. Colour: iridescent silvery; jet black patch on front of head, another, oblong in form, at base of dorsal fin slightly behind head; dusky areas on each side of body above lateral line, 4, below lateral line, 2; carmine red on dorsal, pelvic and caudal fins in life.

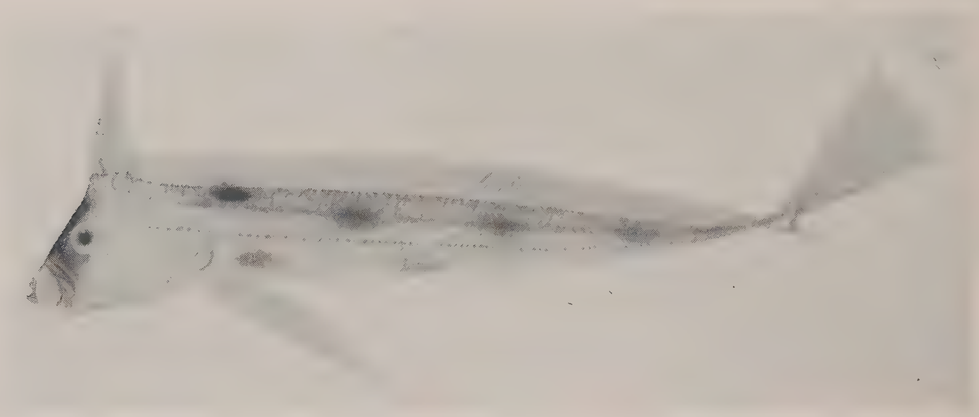

FIGURE 80. King-of-the-salmon. *Trachypterus rex-salmonorum* Jordan and Gilbert 1894

Length to 8 feet.

Distinguished by the ribbon-shaped body, the high anterior portion of the long dorsal fin, the absence of an anal fin and the greatly developed upper lobe of the caudal fin.

The king-of-the-salmon was first taken in British Columbia waters in 1907 off Sherringham point in a salmon-trap and it, together with a second individual obtained in August, 1908, are now in the collection of the Provincial Museum at Victoria. These specimens were recorded in 1923 by H. W. Fowler as *Trachipterus rex-salmonorum* Jordan and Gilbert. On January 20, 1935, an individual was found on the beach at Pender island. On February 6, 1943, a female 5 feet 11 inches in total length was taken on a salmon-spoon off Sooke harbour and early in the same year another individual 5½ feet in length was captured off Barkley sound. A small specimen 5½ inches in total length, in excellent condition, was captured in June, 1941, near the wharf at Nootka, with both pelvic and caudal fins well developed. The young of this species have been secured rather frequently in southern California waters. They differ markedly from the adults in form of body and fin characters and undergo an extensive metamorphosis during development. In the larval stage the dorsal and pelvic fin rays are greatly elongate and very delicate, evidently serving as flotation organs. As development continues these elongate rays gradually shorten or break off until in some adults the pelvic fins may disappear. The lower lobe of the caudal fin is best developed in the young but it gradually becomes reduced in size to a mere projection while the upper grows rapidly, bends forward and upward until it forms a large fan-shaped structure.

Range southern California to Vancouver island.

Order BERYCOMORPHI

In this order the body is stout and covered with cycloid scales. The mouth is bordered above by protrusible premaxillaries. The anterior portions of the vertical fins are spinous; the pelvic fins are thoracic, each with a spine and 3 to 13 rays; the caudal fin has 19 principal rays, the outer two unbranched, and usually 3 to 5 short spines above and below.

The order appears to be intermediate between the orders Isospondyli and Percomorphi on the basis of the above and other characters, especially those of the skull.

There are about eleven families in the order, but only one, the Melamphaidae, is represented in British Columbia waters.

Family MELAMPHAIDAE Melamphids

In the melamphids the bones of the head are thin and paper-like, the whole skull being soft and spongy and frequently raised into soft ridges and spines. The superficial bones are penetrated by numerous wide muciferous tubes.

These are oceanic fishes found at considerable depths, usually brown to black in colour.

Crested melamphid *Melamphaes rugosus* Chapman 1939

Body elongate, stout; caudal peduncle elongate. Head large, deep, blunt, sculptured; mouth terminal, large, oblique; lower jaw projecting; teeth small, villiform, on premaxillaries and dentaries; snout high, sloping; eye moderate, diameter about 5.8 in length of head; rostral spine, prominent; frontal crest conspicuous, crenulate. Fins: dorsal (1), III, 12, short; anal, I, 9; pelvic, I, 7, thoracic; pectoral, 13, long, slender, longer than head; caudal, III, 19, III, furcate. Lateral line: absent. Scales: cycloid, large; in oblique rows above midline of body, about 25. Colour: black.

Length to 3.7 inches.

Distinguished by the sculptured head, the prominent crest on the top of the head and the prominent rostral spine.

The crested melamphid has been taken once in British Columbia waters, February 9, 1939, off the west coast of Moresby island by the International Fisheries Commission, station 1763C, lat. 52° 23′ N., long. 132° 04′ W., in a vertical net haul, depth between 487 and 379 fathoms. The single specimen obtained was loaned from the Commission's collection by the Director, Mr. H. A. Dunlop, who also supplied the accompanying data, heretofore unpublished.

Range northern British Columbia to northwestern Alaska.

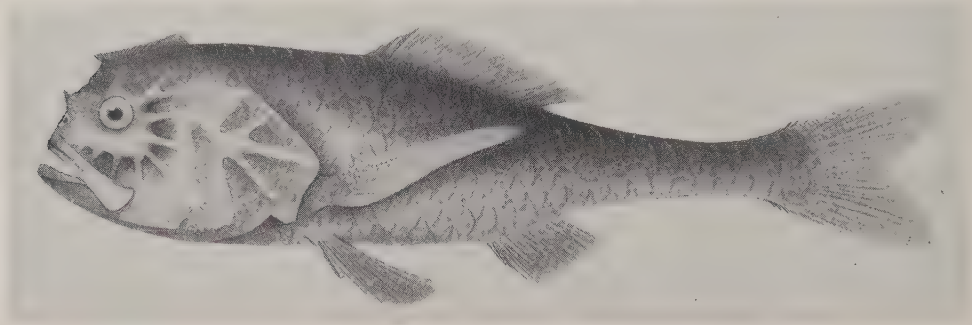

FIGURE 81. Crested melamphid. *Melamphaes rugosus* Chapman 1939

High-snouted melamphid *Melamphaes cavernosus* Chapman 1939

Body elongate, stout; caudal peduncle elongate. Head large, deep, blunt, sculptured; mouth terminal, large, oblique; lower jaw projecting; teeth small, villiform on each jaw; snout high, vertical; eye small, diameter 6.2 to 7.1 in length of head; rostral spine, absent; frontal crest, absent. Fins: dorsal (1), III, 15 or 16, short; anal, 1, 8 or 9; pelvic, 1, 7, thoracic; pectoral, 15 or 16, elongate, shorter than head; caudal, III to V, 19, III, furcate. Lateral line: absent. Scales: cycloid, large; in oblique rows above midline of body, 29 to 31. Colour: black.

Length to 3 inches.

Distinguished by the sculptured head, the high vertical snout, the absence of a crest from the top of the head and the absence of a rostral spine.

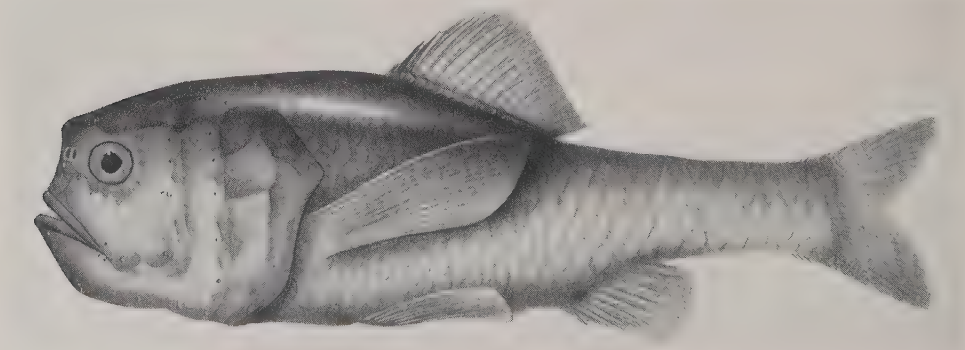

FIGURE 82. High-snouted melamphid. *Melamphaes cavernosus* Chapman 1939

The high-snouted melamphid is known from British Columbia waters by a single specimen taken March 13, 1934, in Queen Charlotte sound by the International Fisheries Commission, station 1119C, lat. 51° 45′ N., long. 131° 54′ W., in a vertical net haul between 487 and 379 fathoms and recorded in 1939 by W. M. Chapman. The type was obtained June 8, 1932, in the gulf of Alaska.

Range northern British Columbia to northwestern Alaska.

Order PERCOMORPHI

In this order are included fishes of very diverse form and size. The pelvic fins are thoracic, each with 1 spine and not more than 5 rays; however, they may be absent; the caudal fin never has more than 17 principal rays, the outer two unbranched. There is no backward projection of any of the suborbital bones to reach the preopercular bone and thus form a bony stay across the cheek.

This order embraces fifteen or more suborders of which nine are represented in British Columbia waters.

Suborder PERCOIDEA

The fishes in this suborder are very diversified in shape, the most generalized of which have a perch form of body. The pelvic fins are thoracic, each with 1 spine and 5 rays.

In this suborder are recognized some eighty families which vary much in external features but are similar in detailed structure. The following families are represented in British Columbia marine waters: Bramidae pomfrets; Sciaenidae, croakers; Embiotocidae, sea-perches; Trichodontidae, sand-fishes; Bathymasteridae, ronquils. In addition, but not included in the present description, there are represented in the fresh waters of the province the yellow perch and the black basses.

Family BRAMIDAE Pomfrets

In the pomfrets the body is strongly compressed, deep anteriorly and terminating posteriorly in a slender caudal peduncle. The profile of the head is rounded. The dorsal and anal fins are long, spinous anteriorly; the pectoral fins are long and pointed; the caudal fin is deeply lunate or furcate.

These are fishes of the open seas and are said to descend to considerable depths. The common pomfret, or Ray's bream, reaches a large size and is widely distributed in both the Atlantic and Pacific oceans. The name *Brama* was applied because of a fancied resemblance to the fresh-water bream.

Pomfret *Brama raii* (Bloch) 1791

Body moderately elongate, deep, strongly compressed; caudal peduncle slender. Head deep, compressed, profile rounded; mouth terminal, moderate; snout nearly vertical. Fins: dorsal (1), III, 30 to 33, long, anterior portion elevated, membranes expanded laterally from each spine and ray; anal, II or III, 25 to 27, long, anterior portion elevated, membranes expanded laterally from each spine and ray; pelvic, 1, 5, thoracic, small, with small fleshy appendage at base, lateral fringes on spine; pectoral, longer than head, falcate; caudal very broad, lunate, membranes expanded laterally from each ray. Lateral line: upcurved anteriorly, nearly straight posteriorly. Scales: cycloid; on side of body wider than long, each with vertical ridge, exposed portion thin; on lateral line, 80 to 84. Colour: dusky to black with bright silvery iridescence; black on snout and opercle; black on margins of dorsal and caudal fins.

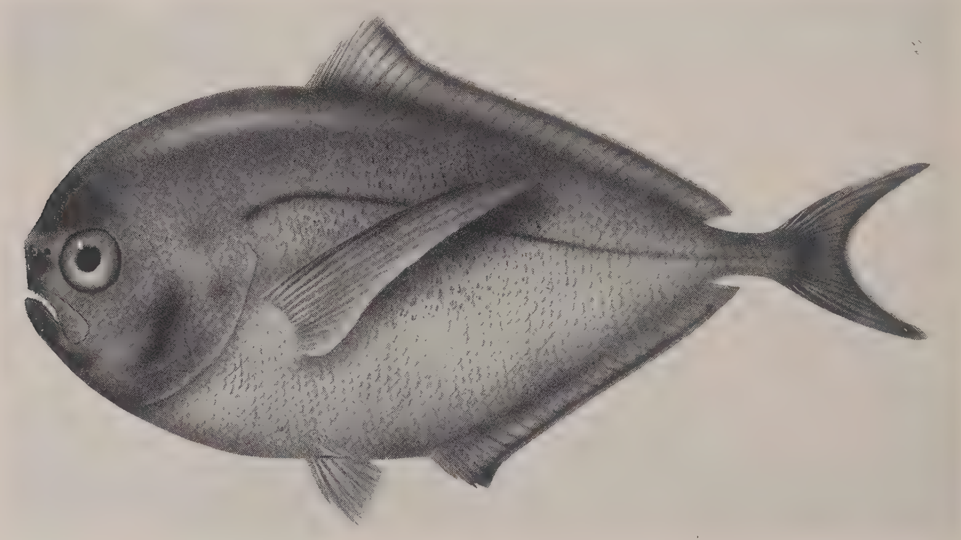

FIGURE 83. Pomfret. *Brama raii* (Bloch) 1791

Length to 4 feet.

Distinguished by the strongly compressed scaly body, the nearly vertical snout, the fleshy appendage at the base of each pelvic fin and the slender caudal peduncle with the very broadly lunate caudal fin.

The pomfret was first recorded from British Columbia waters in 1883 by T. H. Bean, who reported, on the authority of Mr. J. G. Swan, that it was not uncommon off Vancouver island. The second specimen known to be taken in these waters was one obtained July 27, 1926, at Ucluelet by Dr. H. C. Williamson and now in the collection of the Royal Ontario Museum of Zoology at Toronto. In some years the species occurs in considerable numbers off the west coast of Vancouver island and the Queen Charlotte islands. Specimens have been secured off Kyuquot, Port Hardy and near Prince Rupert off the Skeena river. Off the Queen Charlotte islands these fish were reported as being so abundant for one day in the summer of 1929 that they interfered with salmon-trolling operations. The pomfret is also referred to as Ray's bream. It is said to be an excellent food fish.

Range southern California to northwestern Alaska.

Family SCIAENIDAE Croakers

In the croakers the body is elongate, somewhat compressed. The maxillary is received under a broad preorbital. The scales are weakly ctenoid, covering body and head, sometimes extending onto the fins. The dorsal fin is deeply notched or divided into two distinct fins, the spinous portion usually being triangular in shape; the pelvic fins are thoracic.

This family consists of approximately 150 species, the majority of which are found in warm seas. Most of the species have the peculiarity of making noises like humming, grunting or croaking which are produced by the vibrations of the air-bladder, hence they are referred to as the croakers. The otoliths, or earbones, are large and are sometimes used as ornaments or carried as "lucky-stones."

White sea-bass *Cynoscion nobilis* (Ayres) 1860

Body elongate, somewhat compressed. Head pointed; mouth terminal, large; lower jaw slightly projecting; maxillary extending to point behind eye; preopercle minutely crenulate posteriorly. Fins: dorsal (2), IX or X—1, 20 to 23, sometimes scarcely connected by membrane; anal, II, 8 or 9, far back on body, base about one-third that of rayed dorsal; pelvic, I, 5, thoracic, with fleshy appendage at base; pectoral shorter than head, pointed; caudal, truncate. Lateral line: high, decurved, then straight. Scales: weakly ctenoid; on body and head even to tip of snout; on lateral line, about 88; in diagonal row above lateral line, 12 or 13; in diagonal row below lateral line, 24 to 27. Colour: metallic blue to coppery on dorsal surface; frosted silvery on ventral surface; dark points, very

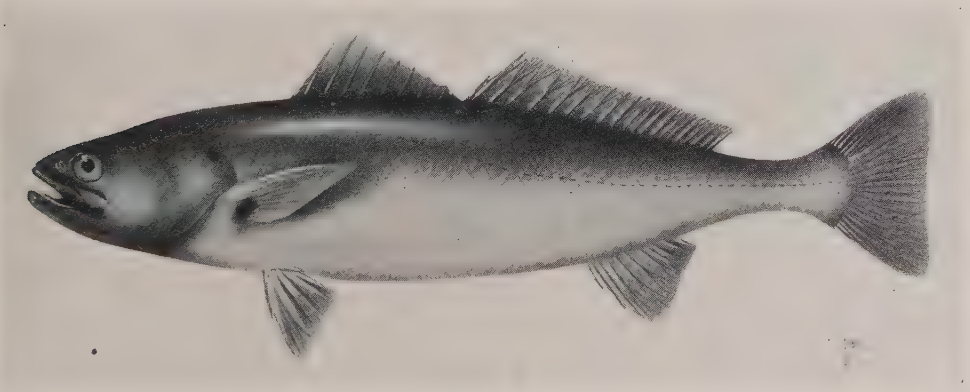

FIGURE 84. White sea-bass. *Cynoscion nobilis* (Ayres) 1860

fine, everywhere dusted over body; black spot prominent on inner base of each pectoral fin, extending onto body.

Length to 6 feet.

Distinguished by the short anal fin with 2 spines and 8 or 9 rays, the fleshy appendage at the base of each pelvic fin, the slightly projecting lower jaw, the dusky metallic blue to coppery coloration and the prominent black spot at the base of each pectoral fin.

The white sea-bass was first taken in British Columbia waters in January, 1893, at Sooke where a specimen weighing 45 pounds was discovered floating by Sir Clive Phillips Wolley. The occurrence was recorded in the same year by D. S. Jordan as *Cynoscion nobilis* and by Ashdown Green as *Atractoscion nobilis* (Ayes). A second individual was obtained July 15, 1906, in a fish-trap at Sherringham point and is now in the Provincial Museum at Victoria. The species is observed occasionally in Juan de Fuca strait and on the west coast of Vancouver island. In California waters it is abundant, ranking about seventh among the marketable fishes and is not only an excellent food fish but is highly prized by sport fishermen. Spawning occurs from March to August near keep beds. The food consists of pilchards, herring, anchovies, smelts, crustaceans, squids, etc.

Range southern California to southeastern Alaska.

King-fish *Genyonemus lineatus* (Ayres) 1855

Body elongate, somewhat compressed. Head bluntly rounded; mouth subterminal, lower jaw included; maxillary extending to point below anterior margin of eye; barbels on membrane below lower jaw, minute, in 2 to 5 pairs; preopercle minutely crenulate posteriorly. Fins: dorsal (2), XII to XV—I, 21 to 24; anal, II, 10 to 12, far back on body, base about one-third that of rayed dorsal, spines weak; pelvic, I, 5, thoracic; pectoral shorter than head, pointed;

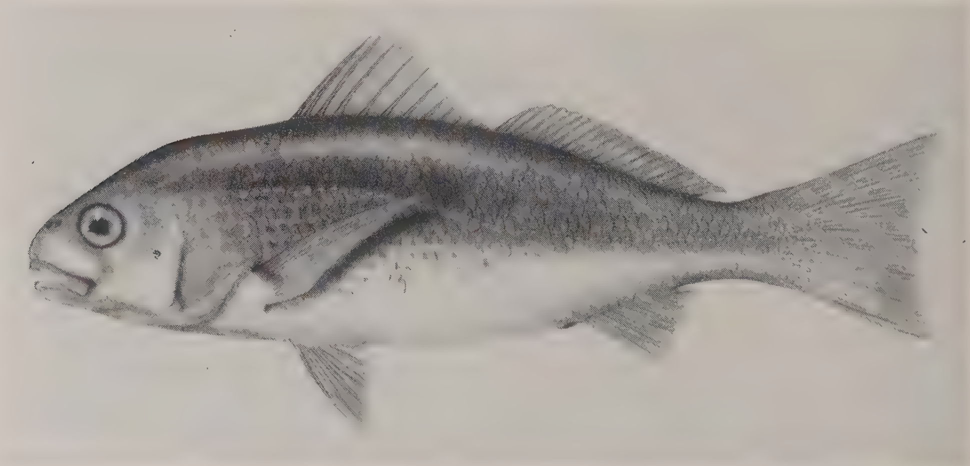

FIGURE 85. King-fish. *Genyonemus lineatus* (Ayres) 1855

caudal, slightly furcate. Lateral line: high, decurved, then straight. Scales: weakly ctenoid; on lateral line, 52 to 54; in diagonal row above lateral line, 7 to 9; in diagonal row below lateral line, 14 to 16. Colour: silvery on dorsal surface; silvery to white on ventral surface; dark points outlining scales; black spot prominent on inner base of each pectoral fin, extending onto body.

Length to 13 inches.

Distinguished by the short anal fin with 2 weak spines and 10 to 12 rays, the minute barbels on the membranes below the subterminal lower jaw and the prominent black spot at the base of each pectoral fin.

The king-fish was first taken in British Columbia waters September 8, 1945, in Barkley sound in Mayne bay at a depth of 10 fathoms in a trawl by Mr. G. H. Smith and the specimen is now in the Provincial Museum at Victoria. This record extends the known range of the species northward from California. The king-fish is common along the coast of California and southward at depths of about 30 fathoms, occurring in small schools. It enters to some extent into the commercial fishery. Spawning occurs from November to May. The food consists of worms, small crustaceans and molluscs.

Range southern California to Vancouver island.

Family EMBIOTOCIDAE Sea-perches

In the sea-perches the body is compressed, elliptical in outline, with a furrow on each side of the base of the dorsal fin. The lips are thick and fleshy, the lower either forming a free border to the jaw or else attached thereto at the symphysis by a frenum. The dorsal fin is spinous anteriorly, rayed, posteriorly; the anal fin has 3 spines with 15 to 35 rays, the anterior portion frequently modified into a thickened glandular structure in the males; the pelvic fins are thoracic, each with 1 spine and 5 rays; the caudal fin is deeply furcate. The scales are cycloid on the body and the sides of the head and form a sheath along the base of the dorsal fin; in the majority of the species the rows of scales above the lateral line tend to follow the dorsal contour of the body while those below tend to be in straight longitudinal lines. The lateral line is continuous and high on the body.

The sea-perches occur in schools and live as a rule in the shallow waters along rocky or sandy beaches or around wharves and kelp beds. They give birth to young of considerable size. The young, while in the oviducts, have very large median fins with fimbriated margins which undoubtedly serve as respiratory structures.

The family comprises about twenty genera distributed along the shores of the north Pacific. The species are all marine except for one which lives in streams in northern California.

Yellow shiner *Cymatogaster aggregatus* Gibbons 1854

Body somewhat elongate, elliptical, compressed; caudal peduncle short, slender, least depth 8.5 to 9 in standard length. Head small; mouth terminal, small; no frenum between lower lip and symphysis of lower jaw. Fins: dorsal (1), IX or X, 18 to 23, low, rayed portion long; anal, III, 23 to 25; pelvic, I, 5, thoracic;

caudal, furcate. Lateral line: high on body anteriorly. Scales: cycloid, large; on lateral line, 38 to 46; in sheath along base of dorsal fin demarked from scales of body by pronounced furrow. Colour: silvery; dusky on dorsal surface; dark points in clusters on lower portion of sides, particularly on anterior half, forming series of longitudinal stripes tapering off posteriorly; light yellow bars across sides below lateral line, 3, vertical; males in winter and spring almost entirely black.

Length to 8 inches.

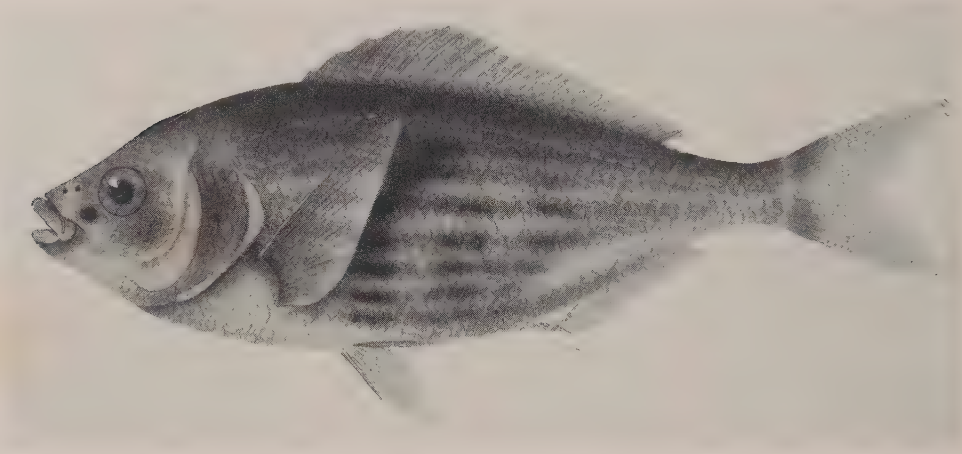

FIGURE 86. Yellow shiner. *Cymatogaster aggregatus* Gibbons 1854

Distinguished by the large scales, the short slender caudal peduncle, the 18 to 23 rays in the dorsal fin, the absence of a frenum between the lower lip and the symphysis of the lower jaw and the vertical light yellow bars on the sides of the body.

The yellow shiner was first taken in British Columbia waters in Esquimalt harbour by J. K. Lord and recorded in 1862 by A. Günther as *Ditrema aggregatum* (Gibbons), the identification being made on skins presented to the British Museum by Earl Russell. The species is abundant along the whole coast, appearing during the summer in schools in shallow water. During the winter months it seems to inhabit deeper water since it is taken commonly in shrimp trawls at depths between 10 and 40 fathoms. Considerable quantities are brought to the markets during the winter as a ready sale is found amongst the Chinese who consider this fish a delicacy. The breeding period appears to extend from April to July and between 8 and 36 young are liberated 10 to 12 months later. The food consists of small crustaceans and other invertebrates. Frequently these fish may be observed around wharves nipping off the appendages of barnacles.

Range southern California to northwestern Alaska.

Brown sea-perch *Brachyistius brevipinnis* (Günther) 1862

Body somewhat elongate, deeply elliptical, compressed; caudal peduncle long, deep, least depth 6 to 7 in standard length. Head small; mouth terminal, small;

frenum between lower lip and symphysis of lower jaw. Fins: dorsal (1), VII to IX, 13 to 15, high, rayed portion short; anal, III, 21 or 22; pelvic, I, 5, thoracic; caudal, furcate. Lateral line: high on body anteriorly. Scales: cycloid, large; on lateral line, 38 to 41; in sheath along base of dorsal fin demarked from scales of body by pronounced furrow. Colour: olive brown on dorsal surface with small dark spot under each scale; light bright coppery red to golden on ventral surface; bluish punctulations in series of longitudinal rows on sides; pale red on fins.

Length to 8 inches.

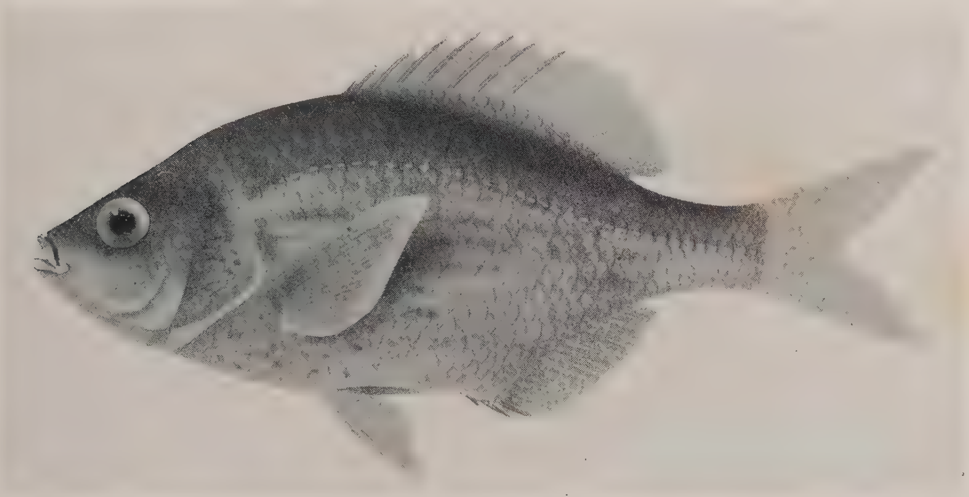

FIGURE 87. Brown sea-perch. *Brachyistius brevipinnis* (Günther) 1862

Distinguished by the large scales, the long stout caudal peduncle, the 13 to 15 rays in the dorsal fin and the frenum between the lower lip and the symphysis of the lower jaw.

The brown sea-perch was first recorded from British Columbia waters in 1862 from Esquimalt harbour by A. Günther who described it as a new species, *Ditrema brevipinne*, on the basis of a skin 7½ inches in length presented to the British Museum by Earl Russell. In 1936, on data supplied by the second author, L. P. Schultz and A. C. DeLacy recorded the species from Departure bay and Round island as *Brachyistius frenatus* Gill. The brown sea-perch is obtained occasionally in the Departure bay area. Nothing is known of its life history.

Range southern California to strait of Georgia.

Blue sea-perch *Taeniotoca lateralis* (Agassiz) 1854

Body elliptical, compressed; caudal peduncle short, deep, least depth 6.5 to 7 in standard length. Head small; mouth terminal, small; frenum between lower lip and symphysis of lower jaw. Fins: dorsal (1), X to XII, 23 or 24, spinous portion low, last spine about three-quarters length of first ray, rayed portion high anteriorly; anal, III, 29 to 31, high; pelvic, I, 5, thoracic; caudal, furcate. Lateral line: high on body anteriorly. Scales: cycloid, small; on lateral line, 63 to 65; in sheath along base of dorsal fin demarked from scales of body by pronounced furrow. Colour: dull red to brown with some green on dorsal surface; black punctulations numerous, fine; dull orange and bright blue in longitudinal stripes along rows of scales on sides of body; bluish black on dorsal and anal fins except for posterior margins, pronounced in males in spring months; clear on pectoral fins; bluish black on pelvic fins; dusky on caudal fin, bluish black along dorsal and ventral margins in males in spring months.

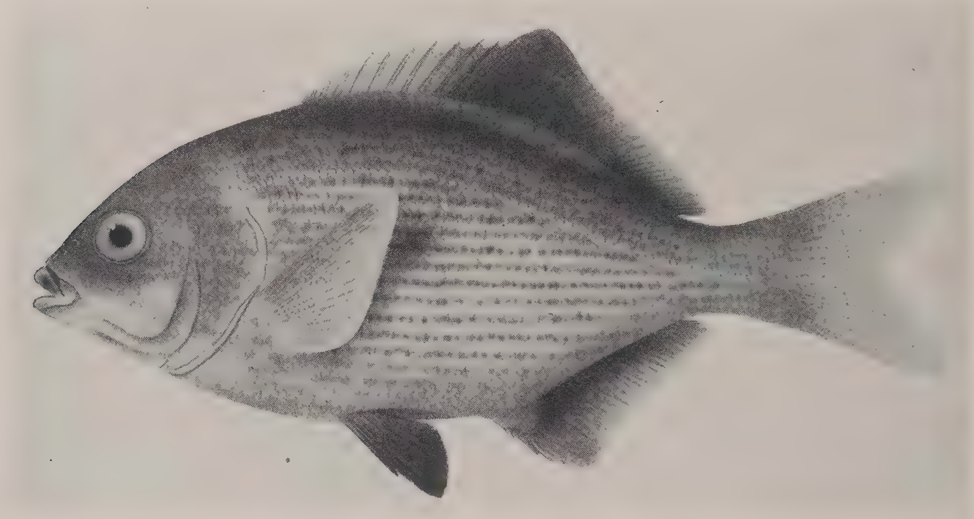

FIGURE 88. Blue sea-perch. *Taeniotoca lateralis* (Agassiz) 1854

Length to 15 inches.

Distinguished by the low spinous portion of the dorsal fin with the last spine about three-quarters of the length of the first ray and the orange and blue longitudinal stripes on the sides of the body.

The blue sea-perch was first recorded from British Columbia waters in 1862 from Victoria harbour by A. Günther as *Ditrema laterale* (Agassiz), based on the skin of an adult fish presented to the British Museum by Earl Russell. In the same year he also recorded two specimens from Esquimalt harbour, collected by Mr. J. K. Lord, as *Ditrema jacksoni*. These are considered by Dr. L. P. Schultz as *T. lateralis*. The blue sea-perch is common in the strait of Georgia and occurs around the southern end of Vancouver island to Ucluelet. This is one of the most beautiful of the marine fishes of the British Columbia coast. The young are born in June and July and 36 have been observed to be liberated from a single female in less than an hour. As many as 44 have been recorded by Dr. C. McLean

Fraser as occurring in one female. The food consists of small crustaceans, worms, mussels and at times herring eggs.

Range southern California to northwestern Alaska.

Dusky sea-perch *Damalichthys vacca* Girard 1855

Body elliptical, compressed; caudal peduncle short, slender, least depth about 8 in standard length. Head small; mouth terminal, small; frenum between lower lip and symphysis of lower jaw. Fins: dorsal (1), X, 21 to 24, spinous portion low, last spine slightly more than half length of first ray, rayed portion high anteriorly, margin distinctly concave; anal, III, 25 to 29; pelvic, I, 5, thoracic; caudal, furcate. Lateral line: high on body anteriorly. Scales: cycloid, small; on lateral line, 56 to 67; in sheath along base of dorsal fin demarked from scales of body by pronounced furrow. Colour: slightly brown on dorsal surface; silvery on ventral surface; sometimes blotches of darker on upper part of body, 3 or 4, vague; small black spot on preopercle behind posterior tip of maxillary; dusky on dorsal, anal and caudal fins; clear on pectoral fins; pale yellow or orange tipped with black on pelvic fins.

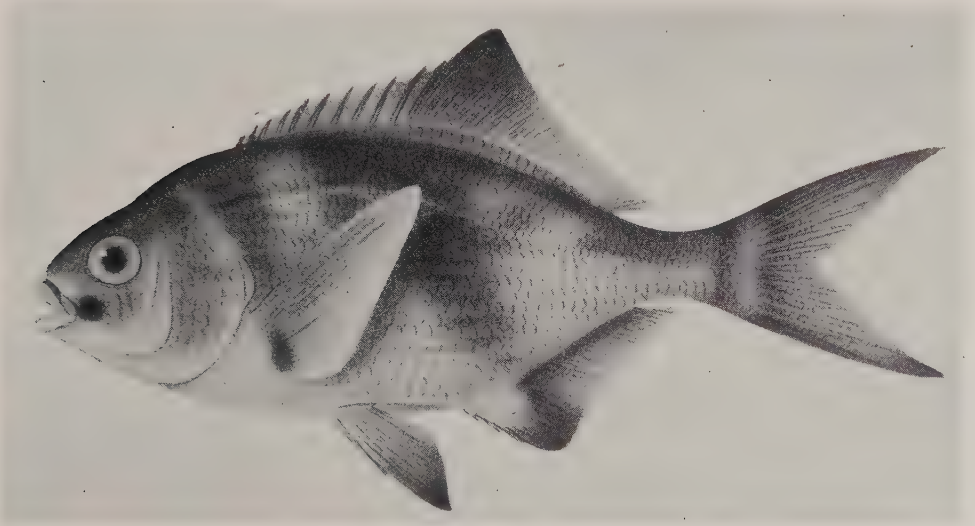

FIGURE 89. Dusky sea-perch. *Damalichthys vacca* Girard 1855

Length to 15 inches.

Distinguished by the low spinous portion of the dorsal fin with the last spine slightly more than half of the length of the first ray and the dusky coloration with the black spot on each preopercle.

The dusky sea-perch was first recorded from British Columbia waters in 1862 by A. Günther as *Ditrema vacca* on the basis of a specimen from Esquimalt harbour collected by J. K. Lord. An individual was taken in the summer of 1881 in Nootka sound at Friendly cove by Capt. H. E. Nichols and recorded in the same year by T. H. Bean as *Damalichthys argyrosomus* (Girard). The species is common around the coast of Vancouver island and in Burrard inlet, inhabiting the shallower water in summer and somewhat deeper in winter. It is caught frequently on hand-lines baited with marine worms and affords considerable sport for the youthful angler.

Range southern California to northwestern Alaska.

White sea-perch *Phanerodon furcatus* Girard 1854

Body elliptical, compressed; caudal peduncle long, slender, least depth 8 to 9.5 in standard length. Head small; mouth terminal, small; frenum between lower lip and symphysis of lower jaw. Fins: dorsal (1), X or XI, 22 to 26, moderate, spines as high as rays, upper margin practically continuous; anal, III, 29 to 34; pelvic, I, 5, thoracic; caudal, deeply furcate. Lateral line: high on body anteriorly. Scales: cycloid, small; on lateral line, 66 to 69; in sheath along base of dorsal fin demarked from scales of body by pronounced furrow. Colour: entirely silvery, slightly darker on dorsal surface, usually dark in furrow at base of dorsal fin; yellowish tinge usually on fins; darkish blotch frequently on anterior portion of anal fin; plain, without markings, on pelvic fins; dusky on margin of caudal fin.

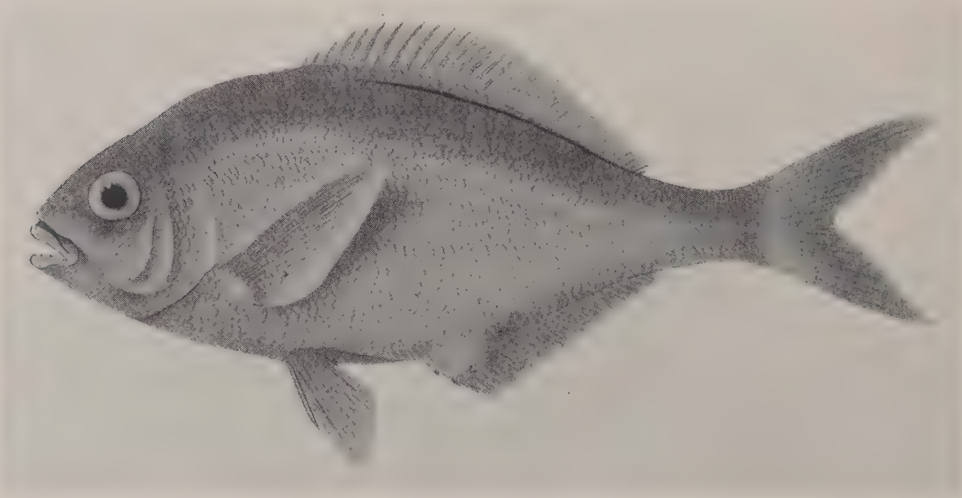

FIGURE 90. White sea-perch. *Phanerodon furcatus* Girard 1854

Length to 12 inches.

Distinguished by the continuous margin of the dorsal fin and the silvery coloration.

The white sea-perch was first recorded from British Columbia waters in 1898 by D. S. Jordan and B. W. Evermann as from Vancouver island. In 1921 C. McLean Fraser referred to the species as occurring in the strait of Georgia. The record in 1916 by the same author is undoubtedly in error since the description states "the spines were all low, the last one being less than half of the length of the soft ray." The species was evidently *Damalichthys vacca*. The white sea-perch is a southern species and may be an uncommon inhabitant of these waters.

Range southern California to Vancouver island.

Wall-eyed sea-perch *Hyperprosopon argenteum* Gibbons 1854

Body elliptical, compressed; caudal peduncle short, slender, least depth about 9.4 in standard length. Head small; mouth terminal, small; no frenum between lower lip and symphysis of lower jaw; rakers below angle of first gill arch, about 21. Fins: dorsal (1), IX to XI, 27 or 28, spinous portion high, angular, maximum height about middle, higher than rayed portion; anal, III, 32 or 33; pelvic, I, 5, thoracic; caudal, furcate. Lateral line: high on body anteriorly. Scales: cycloid, small; on lateral line, 72 to 74; in sheath along base of dorsal fin demarked from scales of body by pronounced furrow. Colour: steely blue on dorsal surface; silvery on sides and ventral surface; dusky bars on each side, about 5, faint, vertical; black on tips of pelvic and caudal fins.

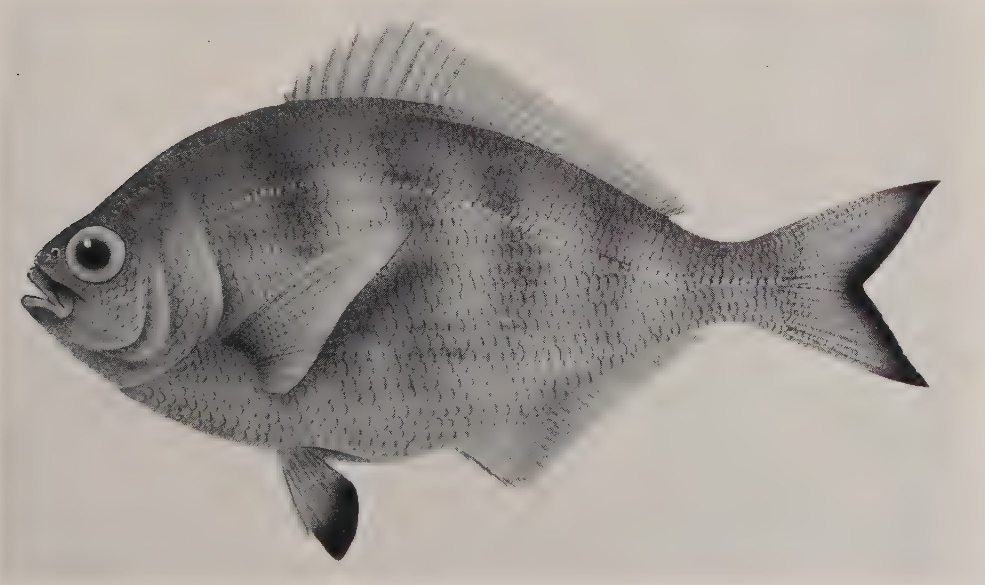

FIGURE 91. Wall-eyed sea-perch. *Hyperprosopon argenteum* Gibbons 1854

Length to 12 inches.

Distinguished by the high angular spinous portion of the dorsal fin, the 21 or more rakers on the first gill arch below the angle, the blue to silvery coloration with the 5 faint dusky bars on each side of the body and the black margins on the pelvic and caudal fins.

The wall-eyed sea-perch was first recorded from British Columbia waters in 1862 from Esquimalt harbour by A. Günther as *Ditrema arcuatum*. The four specimens so identified were collected by J. K. Lord and constitute the only known record from these waters. It occurs southward to California where it is the second most important sea-perch commercially.

Range southern California to Juan de Fuca strait.

Porgy *Holconotus rhodoterus* Agassiz 1854

Body elliptical, compressed; caudal peduncle short, slender, deep, least depth about 9 in standard length. Head small; mouth terminal, small; no frenum between lower lip and symphysis of lower jaw; rakers below angle of first gill arch, 11 to 13. Fins: dorsal (1), IX or X, 26, spinous portion high, angular, maximum height about middle, higher than rayed portion; anal, III, 28 to 31; pelvic, I, 5 thoracic; caudal, furcate. Lateral line: high on body anteriorly. Scales: cycloid, small; on lateral line, 67 to 70; in sheath along base of dorsal fin demarked from scales of body by pronounced furrow. Colour: light green on dorsal surface; silvery on sides and ventral surface; reddish bars on each side,

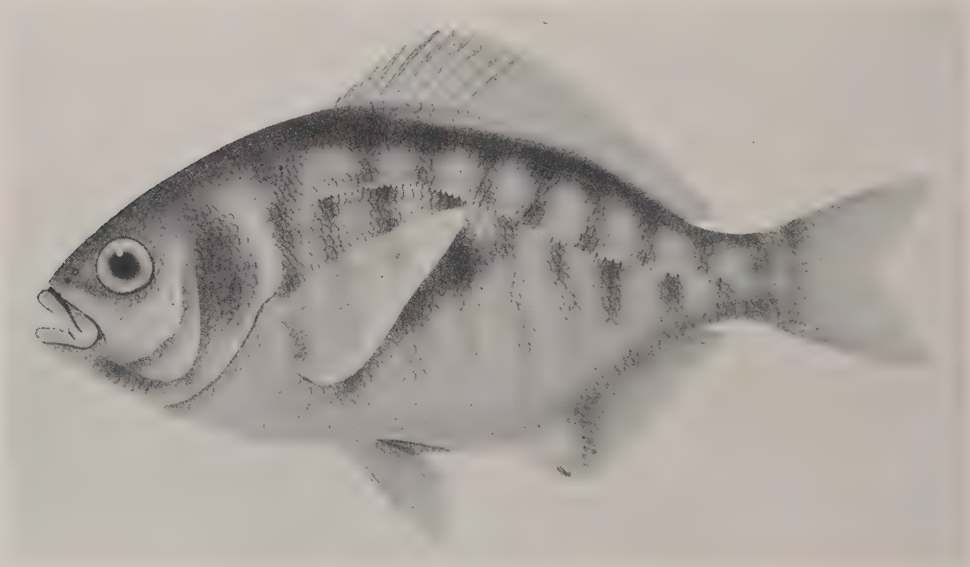

FIGURE 92. Porgy. *Holconotus rhodoterus* Agassiz 1854

about 10, narrow, vertical, those above lateral line alternating with those below; bright light red on pelvic, anal and caudal fins.

Length to 12 inches.

Distinguished by the high angular spinous portion of the dorsal fin, the 11 to 13 rakers on the first gill arch below the angle and the reddish vertical bars above the lateral line alternating with those below.

The porgy was first recorded from British Columbia waters in 1862 by A. Günther as *Ditrema rhodoterum*, on the basis of five specimens from Esquimalt harbour collected by J. K. Lord. Two specimens were taken April 12, 1948, off Hesquiat. In California this species is sometimes spoken of as the pogie.

Range southern California to west coast of Vancouver Island.

Family TRICHODONTIDAE Sand-fishes

In the sand-fishes the body is elongate, somewhat compressed and without scales. The mouth is nearly vertical with fringed lips and the eyes are high on the head. The pectoral fins are large, very broad and procurrent.

The sand-fishes have the habit of burying themselves in the sand with only the mouth and eyes exposed. While only the genus *Trichodon* has been taken in the British Columbia area another genus, *Arctoscopus*, has been recorded from southeastern Alaska, and may eventually be discovered in the northern waters of the province.

Sand-fish *Trichodon trichodon* (Tilesius) 1811

Body moderately elongate, deep anteriorly, much compressed. Head moderate, length about 3.5 in standard length; mouth terminal, large, opening

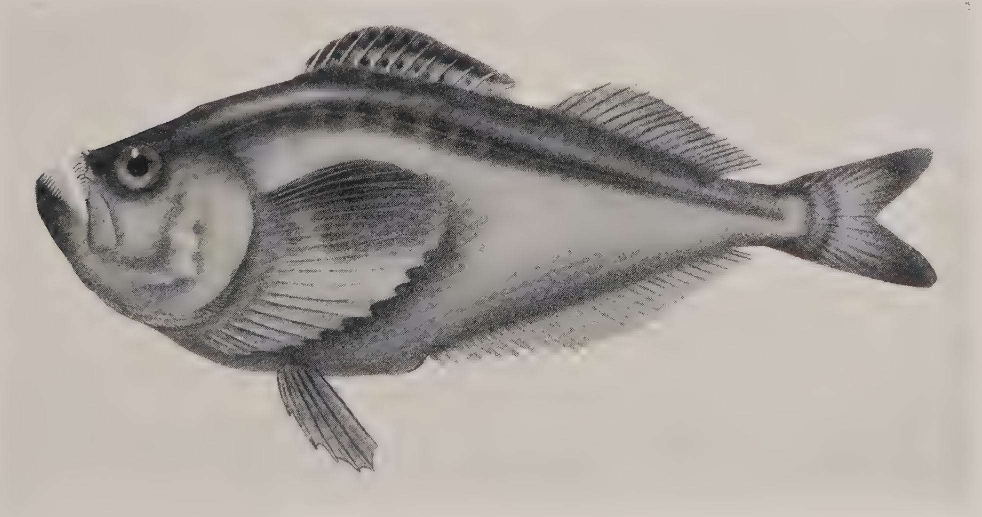

FIGURE 93. Sand-fish. *Trichodon trichodon* (Tilesius) 1811

upward; jaws nearly vertical; lips prominently fringed; teeth on jaws small, sharp, recurved; eye high on head; preopercular spines, 5. Fins: dorsal (2), XIII to XV—I, 18 to 20, slightly separated; anal, about 28, long; pelvic, I, 5, thoracic; pectoral, about 22, large, broadly rounded, procurrent. Lateral line: faint, high, following dorsal contour of body. Scales: absent. Colour: light brown on dorsal surface; silvery on ventral surface; dark streak above lateral line, in irregular patches anteriorly; light brown along margin of spinous dorsal fin with dark spots in two series.

Length to 12 inches.

Distinguished by the almost vertical jaws, the fringed lips, the absence of scales and the broad procurrent pectoral fins.

The sand-fish was first taken in British Columbia waters in 1892 near Victoria. The specimen was deposited in the Provincial Museum and recorded in 1898 by J. Fannin as *Trichodon stelleri* Tilesius. Other individuals have been secured on the west coast of Vancouver island and off the mouth of the Nass river. Though not obtained frequently it appears to be distributed widely, particularly in Alaskan waters. A specimen from Wickaninnish bay (Long beach), was discovered February 23, 1936, by Mr. Hillier in sand at a depth of about a foot. It was a female about 12 inches in length and extruded mature eggs when disturbed. Another individual was found June 15, 1939, off Stevens island in the stomach of a spring salmon.

Range northern California to northwestern Alaska.

Family BATHYMASTERIDAE Ronquils

In the ronquils the body is elongate with small cycloid or ctenoid scales. The lateral line is high and straight. The head is subconic, well supplied with mucous pores. The dorsal fin is long, composed of rays, the anterior of which are entire, the remainder branched; the anal fin is long, supported by rays only; the pectoral fins are broad and rounded; the pelvic fins are thoracic, each with 1 spine and 5 rays.

The members of this family are bottom-living fishes of moderate depths. The two species recorded herein are of northern distribution.

Searcher *Bathymaster signatus* Cope 1783

Body elongate, moderately compressed. Head subconic; mouth terminal, large; maxillary extending to point below posterior margin of pupil; eye high; gill membranes separate, slightly joined anteriorly to isthmus. Fins: dorsal (1), about 47, long, high, first 3 or 4 rays entire, remainder branched; anal, 32 to 34; pelvic, 1, 5, thoracic; pectoral, about 21, rounded; caudal, truncate, rounded. Lateral line: high, almost straight. Scales: ctenoid; extending onto dorsal and pectoral fins about half length of rays; absent from cheek. Pores: on lateral line, about 100, each covered with fleshy flap; on head, numerous, large, mostly elevated, some with dermal flap. Colour: brown on dorsal surface with dark markings; lighter on ventral surface with yellow to orange streaks; yellow on head in some areas; yellow mottlings on fins; black blotch on anterior of dorsal fin conspicuous, extending backward to fourth or fifth ray; dusky on pelvic and anal fins; somewhat dusky on other fins.

Length to 12 inches.

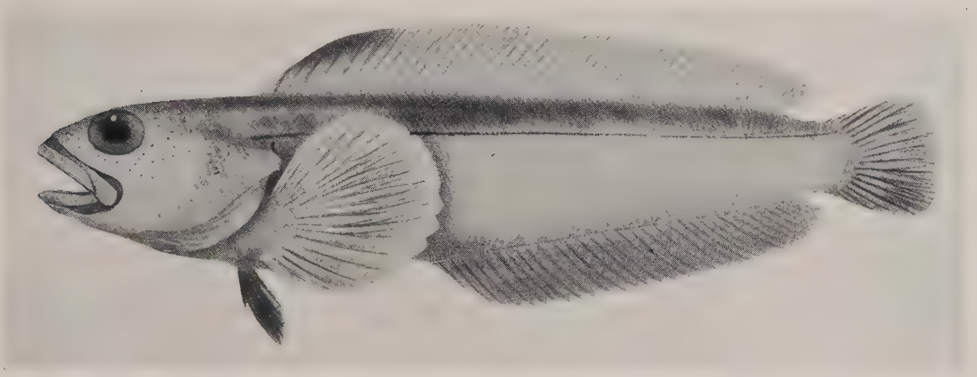

FIGURE 94. Searcher. *Bathymaster signatus* Cope 1873

Distinguished by the first 3 or 4 rays in the dorsal fin entire and the remainder branched, the prominent elevated pores on the head, the ctenoid scales and the absence of scales from the cheeks.

The searcher was first taken in British Columbia waters in June, 1882, north of Milbanke sound at Carter bay, by Capt. H. E. Nichols and recorded in 1883 by T. H. Bean. A second specimen, a male, 9¼ inches in total length was obtained August 15, 1924, off the west coast of the Queen Charlotte islands by Capt. A. M. Henderson of the Fisheries Patrol Service and is now in the collection of the Pacific Biological Station at Nanaimo.

Range Puget sound to northwestern Alaska.

Ronquil *Ronquilus jordani* (Gilbert) 1888

Body elongate, rounded anteriorly. Head subconic; mouth terminal, moderate; maxillary extending to point approximately below anterior margin of pupil; eye large, high; gill membranes separate, slightly joined anteriorly to isthmus; in male, puffy crest from snout to dorsal fin, conspicuous in breeding season. Fins: dorsal (1), 41 to 48, long, high, first 20 to 30 rays entire, remainder branched; anal, 31 to 34; pelvic, I, 5, thoracic; pectoral, about 18, rounded; caudal, rounded. Lateral line: high, almost straight. Scales: cycloid; absent from fins; on cheek below and behind eye, numerous, minute. Pores: on lateral line, about 93, exposed; on head numerous, not conspicuous, none elevated. Colour of male: reddish olive on dorsal surface; dull olive green on ventral surface; yellow longitudinal lines below lateral line, 2, or more, fine; golden bar below eye, another across middle of cheek; jet black behind eye; black saddle across occiput extending onto opercle; dusky blotch on anterior of dorsal fin, small; black, margined with yellow, on dorsal and caudal fins; iridescent light blue, margined with black, on anal fin (these colours particularly brilliant in breeding season); black entirely on pelvic fins; yellow on upper half, black on lower half of pectoral fins. Colour of female: olive green on dorsal surface; lighter on ventral surface; yellow longitudinal lines on sides as in male; somewhat red on occiput; dusky blotch on anterior of dorsal fin as in male; dull orange on tips of dorsal and caudal fins; pale light blue, margined with brown, on anal fin; white on pelvic fins.

Length to 6¾ nches.

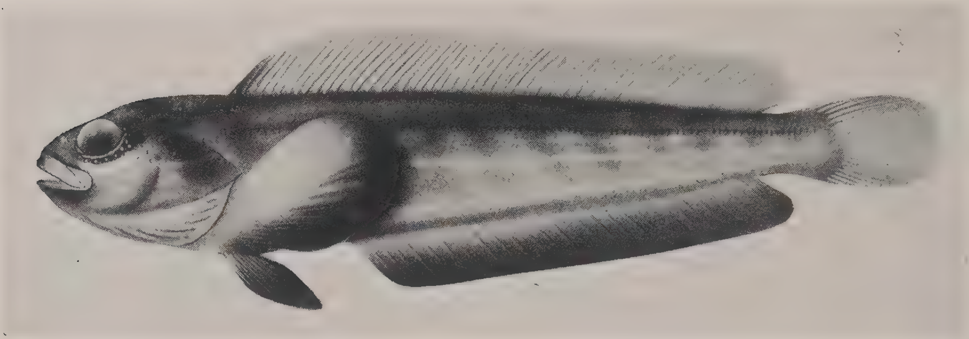

FIGURE 95. · Ronquil. *Ronquilus jordani* (Gilbert) 1888

Distinguished by the first 20 to 30 rays in the dorsal fin entire and the remainder branched, the cycloid scales, the minute scales on the cheeks and the inconspicuous pores on the head.

The ronquil was first taken in British Columbia waters September 4, 1891, east of Victoria by the *Albatross*, station 3465, lat. 48° 21′ N., long. 123° 14′ W., depth 48 fathoms and recorded in 1895 by C. H. Gilbert as *Bathymaster jordani* Gilbert. Apparently it is fairly common along the whole coast and has been captured in the strait of Georgia, off the west coast of Vancouver island west of Vargas island at a depth of 24 fathoms, at Fort Rupert and northward to Prince Rupert at various depths down to 90 fathoms. Shrimp trawlers frequently secure individuals in Burrard inlet at depths of 10 to 20 fathoms. Females with fully developed salmon-coloured eggs have been taken early in March and at this time the males were in full breeding colours. It appears to be a fish of northern distribution.

Range Puget sound to northwestern Alaska.

Suborder AMMODYTIOIDEA

The fishes in this suborder have elongate slender bodies. The vertical fins are without spines; the pelvic fins, if present, are thoracic, each with 1 spine and 3 rays.

There is only one family, Ammodytidae, in the suborder.

In the sand-lances the body is elongate, slender and covered with small cycloid scales. The lateral line is high and straight. The head is long and pointed with the lower jaw projecting; teeth are absent and the gill rakers are long and slender. The dorsal fin is long, supported by rays only, and the pelvic fins usually are absent.

The fishes of this family often occur in large schools near the shore and frequently are abundant on banks off shore. They are active in the surf of sandy shores and in quiet waters sometimes can be seen partially buried in the sand.

Sand-lance *Ammodytes tobianus personatus* Girard 1856

Body elongate, very slender. Head elongate, sharply pointed; mouth terminal, moderate; lower jaw projecting; maxillary reaching to point below front of eye; teeth, absent from jaws; snout elongate, pointed; gill membranes separate, free from isthmus; gill rakers, long, slender. Skin: on side of body in 130 to 150 diagonal folds; above ventrolateral angle of body in slender delicate longitudinal fold. Fins: dorsal (1), 54 to 59, very long; anal, 24 to 30, less than half length of dorsal; pelvic, absent; pectoral, narrow, low; caudal, deeply furcate. Lateral line: high, almost straight, close to dorsal fin. Scales: cycloid, minute. Colour: pale light green on dorsal surface; silvery on ventral surface.

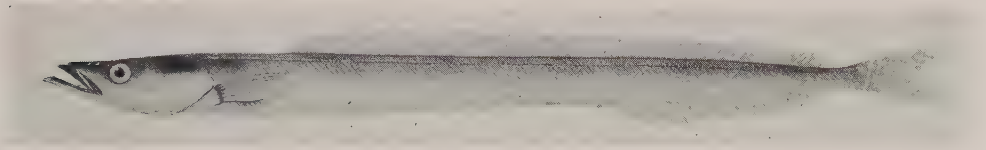

FIGURE 96. Sand-lance. *Ammodytes tobianus personatus* Girard 1856

Length to 8 inches.

Distinguished by the sharply pointed head with the projecting lower jaw, the oblique folds of skin along the sides of the very slender body, the delicate longitudinal folds above the ventrolateral angles of the body and the absence of pelvic fins.

The sand-lance was first taken in British Columbia waters in June, 1882, near Port Simpson by Capt. H. E. Nichols, and recorded in 1883 by T. H. Bean as *Ammodytes personatus* Girard. It is everywhere abundant along the coast, occurring in large schools. At times it may bury itself in the sand of the beaches and has been observed with the anterior third of the body projecting obliquely from the sea bottom. It feeds upon plankton, especially small crustaceans, including barnacle larvae, and in turn is eaten extensively by spring and coho salmon, lingcod, halibut and many other fishes and to some extent by the fur-seal. The sand-lance is said to be an excellent food fish of delicious flavour.

Range southern California to northwestern Alaska.

Suborder TRICHIUROIDEA

The fishes in this suborder have the body mackerel-like or ribbon-like. The premaxillaries are non-protractile, beak-like, firmly attached to the maxillaries. The lower jaws are usually projecting. The teeth are mostly strong and canine-like. The dorsal fins are long and the pectoral fins are placed low on the body.

One family, the Trichiuridae, is represented in British Columbia waters.

Family TRICHIURIDAE Hair-tails

In the hair-tails the body is elongate, strongly compressed, without scales. The dorsal fin is long and low, composed of rays; the pectoral fins are small, placed low on the body; the pelvic fins are absent, or each is represented by a minute spine or scale-like structure thoracic in position; the caudal fin is small pointed or deeply forked.

Frost-fish *Benthodesmus atlanticus* Goode and Bean 1895

Body very elongate, slender, much compressed, tapering to very slender caudal peduncle narrower than diameter of pupil. Head elongate, flattened above; mouth terminal, large; upper jaw beak-like; lower jaw projecting, barbel at tip conspicuous; teeth numerous, canine-like; four very long; eye large, about midlength of head. Fins: dorsal (1), 142 to 154, long, low, continuous from opercular region to caudal peduncle; anal, 88 to 100, extending from anus to caudal peduncle; pelvic absent, or represented by minute spine or scale-like structure; pectoral, 12, small, placed low on body; caudal, small, deeply furcate. Lateral line: almost straight, in deep furrow. Scales: absent. Colour: silvery anteriorly; gray to black posteriorly; black on lips, inside of mouth and gill cavity; black on peritoneum.

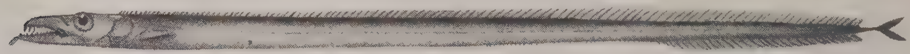

FIGURE 97. Frost-fish. *Benthodesmus atlanticus* Goode and Bean 1895

Length to 3 feet 5½ inches.

Distinguished by the very elongate compressed body, the elongate head with the beak-like upper jaw, the barbel on the tip of the lower jaw, the large teeth, the slender caudal peduncle and the small deeply forked caudal fin.

The frost-fish is represented by a single specimen taken May 30, 1916, at Bentinck island near Victoria. It was recorded in 1917 by C. H. Gilbert and is now in the Provincial Museum at Victoria. This apparently constitutes the only record for the Pacific. The species occurs in the north Atlantic as an inhabitant of deep waters.

Range Juan de Fuca strait.

Suborder SCOMBROIDEA

The fishes in this suborder have a fusiform body with a slender caudal peduncle. The head is conical, the premaxillary is immovable, produced and pointed to a greater or lesser extent. The dorsal fins are two in number, the anterior high and weakly spinous, depressible in a groove or fleshy sheath; the posterior low and rayed; the pectoral fins are placed high on the body; the pelvic fins, when present, are thoracic; the caudal fin is widely forked.

Four families are included in this suborder: Carangidae, carangids; Scombridae, mackerels; Histiophoridae, sail-fishes; and Xiphiidae, sword-fishes. The first two families are represented in British Columbia waters.

Family CARANGIDAE Carangids

In the carangids the body is elongate to deep with a very slender peduncle. The scales are cycloid. The lateral line is complete, arched anteriorly, straight posteriorly, sometimes armed with large spinous scales. There are two dorsal fins, the first spinous and usually depressible in a groove and the caudal fin is widely forked.

The carangids are pelagic, mostly swift swimmers and are abundant in warm seas.

Scad *Decapterus polyaspis* Walford and Myers 1944

Body elongate, fusiform; caudal peduncle slender, depth less than diameter of eye. Head pointed; mouth terminal, moderate; maxillary not reaching to point below anterior margin of eye; teeth, small; eye large, partially covered anteriorly and posteriorly with strong transparent membranes. Fins: dorsal (2), VIII—I, 31 to 34—1, spinous fin triangular, depressible in groove, rayed fin high anteriorly, depressible in groove, low posteriorly, followed by free finlet; anal (2), II—I, 27 to 29—1, anterior fin depressible in groove, posterior fin high anteriorly,

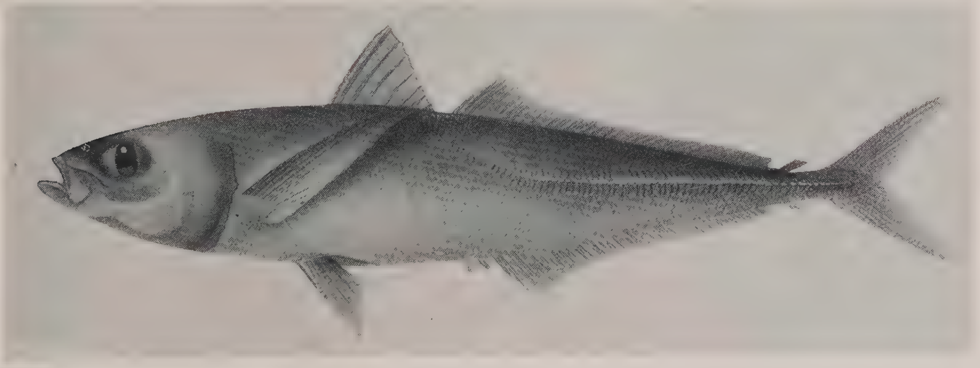

FIGURE 98. Scad. *Decapterus polyaspis* Walford and Myers 1944

low posteriorly, followed by free finlet; pelvic, I, 5, thoracic; pectoral, pointed; caudal, deeply furcate. Lateral line: high anteriorly to point below interspace between dorsal fins, decurved to midline of body, thence straight to end of body. Scales: cycloid; on lateral line, 50 to 53 + 43 to 52, smooth anteriorly, scute-like spinous posteriorly. Colour: metallic blue on dorsal surface; somewhat silvery on ventral surface.

Length to 2 feet 1 inch.

Distinguished by the single free finlet following both the rayed dorsal fin and the second anal fin, the small anterior and fin supported by 2 spines and the decurved lateral line with the numerous enlarged scute-like spinous scales on the posterior straight portion.

The scad was first taken in British Columbia waters August 27, 1934, near Nootka, about 20 miles off shore. Two specimens, each 21 inches in length, were obtained by Mr. Martin Brevik while fishing for pilchards. They were sent to the Pacific Biological Station at Nanaimo where they were identified tentatively as *Trachurus symmetricus* and recorded anonymously as such in the same year. During the following five years several other individuals were secured in the same general region and one was obtained from Massett inlet. Critical examination of Oregon and the above British Columbia specimens by Walford and Myers revealed a new species to which the specific name *polyaspis* was given, referring to the large number of scutes on each lateral line. In December 1944, the attention of the authors was drawn to a shipment of 5 tons of fish in cold storage in Vancouver which had been secured four months previously east of Moresby island in Selwyn channel in a purse-seine. Upon identification as *Decapterus polyaspis* the fish were disposed of for canning purposes. There is a report that about 1939 over 8 tons of these fish had been landed on the west coast of Vancouver island at Kildonan and after being held in cold storage for several years were finally reduced to oil and meal.

Range northern California to Queen Charlotte islands.

Family SCOMBRIDAE Mackerels

In the mackerels the body is streamlined with a slender keeled caudal peduncle. The scales are cycloid. The lateral line is undulating. A series of finlets occurs posterior to both rayed dorsal and anal fins; the pelvic fins are thoracic, each with 1 spine and 5 rays.

The mackerels are among the most rapid swimmers of the fishes. The statement has been made, "The contours are said by nautical engineers to be perfect for passage through the water with least resistance." Not only is the body of streamline form but it is very smooth and the pectoral, pelvic and spinous dorsal fins are set in grooves on the body so that when appressed and depressed they offer little resistance to the water.

Included in the family are the various mackerels, bonitos, albacores and tunnies, all of which are of great importance as commercial and sport fishes.

Pacific mackerel *Pneumatophorus diego* (Ayres) 1856

Body elongate, fusiform; caudal peduncle slender, keel absent. Head conical; mouth terminal, moderate. Fins: dorsal (2), VIII to X—1, 12, interspace greater than length of pectoral fin, spinous fin short, high, triangular, finlets, 5 or 6; anal, II, 11, origin slightly behind that of rayed dorsal, finlets, 5 or 6; pelvic, I, 5, thoracic; pectoral, shorter than head, triangular; caudal, lunate. Lateral line: slightly wavy. Scales: cycloid, very small; covering body. Colour: metallic steel blue on dorsal surface; silvery on ventral surface; iridescent blackish stripes, 25 to 30, irregular, wavy, extending obliquely forward across back to short distance below lateral line.

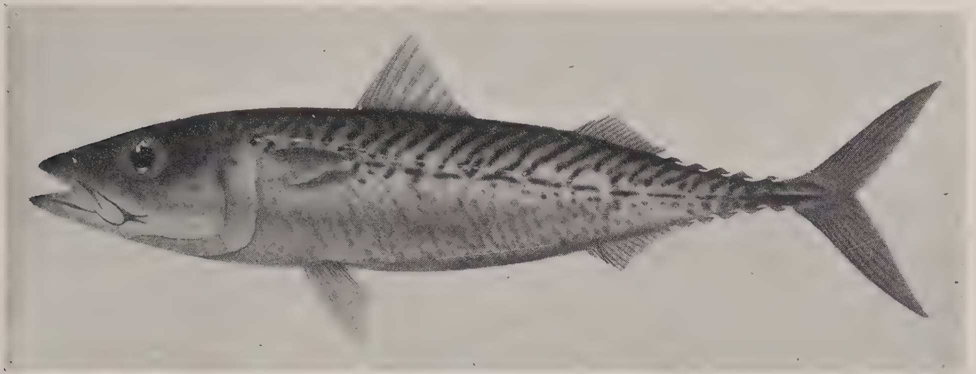

FIGURE 99. Pacific mackerel. *Pneumatophorus diego* (Ayres) 1856

Length to 20 inches.

Distinguished by the slender caudal peduncle with 5 or 6 finlets above and below, the long interspace between the dorsal fins and the 25 to 30 irregular wavy blackish stripes across the back and down the sides of the body.

The Pacific mackerel was first taken in British Columbia waters November 30, 1904, at Nanaimo. The two specimens secured were presented to the Provincial Museum at Victoria and were recorded in 1909 by F. Kermode as *Scomba colias* Gmelin. The species is very abundant at times off the west coast of Vancouver island where many tons are sometimes obtained in purse-seines. Small numbers enter the strait of Georgia and small schools have been observed in the vicinity of Prince Rupert. Spawning has not been observed in British Columbia waters but is known to take place off the California coast from late April through July near the shore usually at depths down to 50 fathoms. A female may produce as many as half a million eggs. These are pelagic and hatch in about three days. Some individuals mature in their second year and the length of life may extend to nine or ten years. The food consists of a varied diet of crustaceans, squids and small fishes. This is an excellent food fish of fine flavour, especially when baked or broiled.

Range southern California to northwestern Alaska.

Bonito *Sarda lineolata* (Girard) 1858

Body elongate, fusiform; caudal peduncle slender, keel on each side. Head pointed, conical; mouth terminal, moderate; gill rakers below angle of first gill arch, 16 or 17. Fins: dorsal (2), XVIII—I, 12, interspace much less than length of pectoral fin, spinous fin long, high anteriorly, finlets, 8 or 9; anal, II, 11, origin below posterior end of rayed dorsal, finlets, 6 or 7; pelvic, I, 5, thoracic; pectoral, shorter than head, extending barely beyond corselet, triangular; caudal, lunate. Lateral line: irregularly wavy. Scales: cycloid, small, covering body; in corselet, large; corselet large, prominent. Colour: dark metallic blue on dorsal surface, shading into silvery on ventral surface; blackish stripes, 10 or 11, narrow, extending backward and upward along upper portion of body.

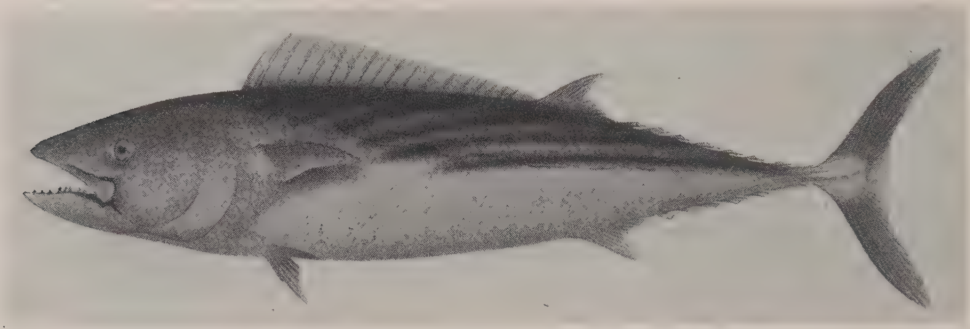

FIGURE 100. Bonito. *Sarda lineolata* (Girard) 1858

Length to 3 feet.

Distinguished by the slender caudal peduncle with finlets above and below, the very short interspace between the dorsal fins and the 10 or 11 narrow stripes extending obliquely along the upper portion of the body.

The bonito was first taken in British Columbia waters in September, 1900, near Rivers inlet and was recorded in 1909 by F. Kermode as *Sarda chilensis* Cuvier and Valenciennes. This specimen is now represented by a cast in the Provincial Museum at Victoria. A second individual, 30½ inches in total length, recorded in the same year as from Victoria, was taken in a salmon-trap at Otter point near Sooke and is also in the Provincial Museum. Individuals are caught occasionally off the west coast of Vancouver island. The bonito is a fish of the open ocean appearing in large schools along the California coast where its food consists principally of squid and various fishes. It is an important food fish, has an excellent flavour when baked and is valued as a sport fish as well.

Range southern California to northern end of Vancouver island.

Skipjack *Katsuwonus pelamis* (Linnaeus) 1758

Body elongate, fusiform; caudal peduncle slender, keel on each side. Head pointed, conical; mouth terminal, moderate; gill rakers below angle of first gill arch, 35 to 43. Fins: dorsal (2), XV or XVI—14 to 16, interspace much less than length of pectoral fin, spinous fin long, high anteriorly, finlets, 7 or 8; anal, II, 12 to 14, origin below posterior end of rayed dorsal, finlets, 6 to 8; pelvic, 1, 5, thoracic; pectoral shorter than head, not extending beyond corselet, triangular; caudal, lunate. Lateral line: nearly straight to point below rayed dorsal fin, sharply decurved, then straight. Scales: cycloid, small, covering upper anterior portion of body. Colour: dark metallic blue on dorsal surface; shading into silvery on ventral surface; black to dusky stripes on lower portion of body, 4 or 5, narrow, longitudinal.

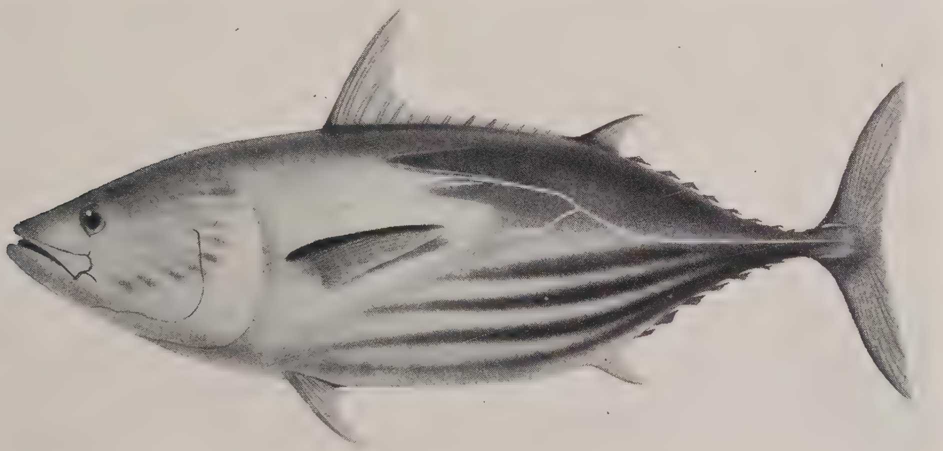

FIGURE 101. Skipjack. *Katsuwonus pelamis* (Linnaeus) 1758

Length to 3 feet.

Distinguished by the slender caudal peduncle with finlets above and below, the very short interspace between the dorsal fins and the 4 or 5 narrow longitudinal stripes along the lower portion of the body.

The skipjack was first taken in British Columbia waters July 6, 1943, in Barkley sound and recorded in the same year by J. L. Hart. The specimen, 25½ inches in total length, is now in the collection of the Pacific Biological Station and constitutes the only record for British Columbia waters. The skipjack is a fish of warm oceanic seas where it usually occurs in large schools. In southern California waters it forms a very important part of the commercial fishery and is also an excellent game fish on light tackle. The food consists of small fishes and plankton crustaceans.

Range southern California to Vancouver island.

Albacore *Thunnus alalunga* (Gmelin) 1788

Body elongate, fusiform; caudal peduncle slender, keel on each side. Head conical; mouth terminal, moderate; gill rakers below angle of first gill arch, 19 to 21. Fins: dorsal (2), XIII or XIV—II, 13 or 14, interspace very short, spinous fin long, high anteriorly, finlets 7 or 8; anal, II, 12 or 13, origin below insertion of rayed dorsal, finlets, 7 or 8; pelvic, I, 5, thoracic; pectoral very long, longer than head, reaching behind insertion of anal fin, sabre-shaped; caudal, lunate. Lateral line: decurved anteriorly, nearly straight for greater part of length. Scales: cycloid, moderate, covering body; corselet small, indistinct. Colour: metallic steely blue on dorsal surface and sides; silvery on ventral surface.

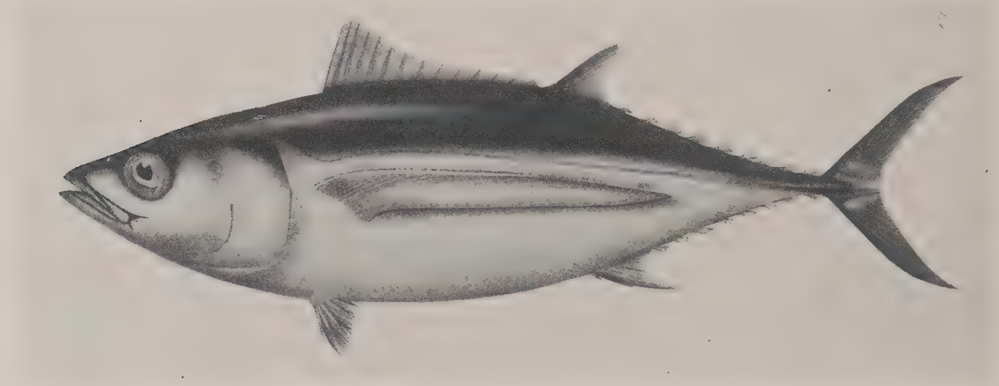

FIGURE 102. Albacore. *Thunnus alalunga* (Gmelin) 1788

Length to 4 feet 1 inch.

Distinguished by the slender caudal peduncle with finlets above and below, the extremely long sabre-shaped pectoral fins and the absence of stripes from the body.

The albacore was first recorded from British Columbia waters in 1938 by I. McT. Cowan as *Germo alalunga* (Gmelin) on the basis of a specimen taken August 17, 1937, near Kyuquot on a salmon troll. The specimen is now in the Provincial Museum at Victoria. An individual was reported in July, 1936, from near Nootka but was not examined. In August, 1939, west of cape St. James, lat. 52° 49′ N., long. 134° 29′ W., three specimens were obtained on a tuna lure and were recorded in 1940 by V. J. Samson. The albacore has been captured off the west coast of Vancouver island in increasing numbers since 1939. The first large commercial catch was made in 1940. The abundance of the fish may prove to be rather variable in Canadian waters since the fishery off the California coast has shown great fluctuations. This pelagic fish is distributed throughout all warm to temperate seas. Since no mature individuals have been taken anywhere along the Pacific coast of North America, it would seem that the albacore is a tropical fish whose young make extensive feeding migrations to distant regions and return to the tropics at the onset of maturity. The food consists of schooling small fishes such as anchovies, pilchards, herring, sauries, young mackerel and albacore, blue lantern-fish (*Tarletonbeania crenularis*), as well as squid and zooplankton. It is a highly-prized sport and commercial fish and is taken with bone, rag and feather jigs towed behind boats. The commercial catch in Canadian waters is secured by trolling with bright red feather lures and is frozen for subsequent canning. Fishermen sometimes refer to the albacore as the tuna or long-finned tuna.

Range southern California to northwestern Alaska.

Suborder GOBIOIDEA

The fishes in this suborder have an elongate, somewhat stout body. The head is depressed. The mouth is large with protractile premaxillaries. The eyes are small, high on the head. The lateral line is absent. The spinous dorsal fin, when present, is small, composed of not more than 8 flexible spines; the anal fin is similar to the rayed dorsal fin; the pelvic fins are thoracic; the caudal fin usually is rounded or slightly pointed.

About 600 species have been described. Only one family is represented in British Columbia waters.

Family GOBIIDAE Gobies

In the gobies the pelvic fins usually are united to form a flaring cone free from the body. The gill openings are small.

The gobies are, for the most part, small bottom-living fishes of shallow coastal waters including estuaries, lagoons and fresh waters in the tropics. However, some species extend into the marine temperate waters.

They inhabit muddy or sandy areas where they lie with the head upraised due to the weight of the body being supported by the pelvic and caudal fins. Frequently they are almost completely buried with only the highly placed eyes visible, but their presence may be detected by sudden spurts of water ejected forcefully backward through the small gill openings.

Five species have been recorded from British Columbia waters but there is considerable doubt as to the validity of the occurrences of *Quietula y-cauda* and *Gillichthys mirabilis*. These two species are omitted from this account for the following reasons: (1) there is much confusion in the records; (2) the species are southern in distribution and have not been taken north of southern California; (3) it is very likely that the latter has been confused with *Clevelandia ios* and the former with *Rhinogobiops nicholsii*.

Large-scaled goby *Rhinogobiops nicholsii* (Bean) 1881

Body elongate, moderately stout, depth 5 to 5.25 in standard length, slightly compressed. Head moderate; mouth terminal, small; maxillary not reaching to point below anterior margin of eye; eye large, diameter 3 to 4 in length of head; crest on head dorsal, median, from slightly behind eyes to origin of spinous dorsal fin. Fins: dorsal (2), VI or VII—12 to 14; anal, 11 or 12; pelvic, thoracic, united, forming hollow cone free from body; caudal, rounded. Lateral line: absent. Scales: cycloid, large; on head, none; in oblique rows above midline of body, 25 to 28. Colour: pale orange olive, irregularly streaked horizontally with purplish brown, promiscuously flecked with metallic green; iridescent stripe below eye, faint; pale yellow, barred with fine wavy vertical orange lines on vertical fins; jet black on tips of first five spines of spinous dorsal fin; white margin on tips of rayed dorsal, anal and caudal fins; black on pelvic fins except at bases.

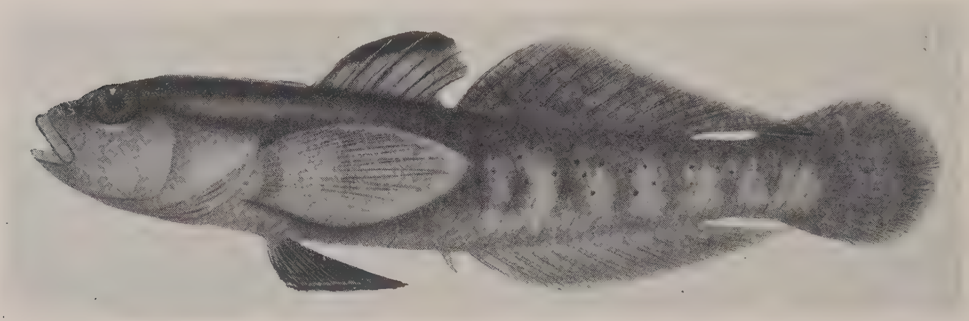

FIGURE 103. Large-scaled goby. *Rhinogobiops nicholsii* (Bean) 1881

Length to 4¾ inches.

Distinguished by the fleshy crest on the top of the head from behind the eyes to the origin of the spinous dorsal fin, the 25 to 28 large scales in oblique rows above the midline of the body, the black area on the spinous dorsal fin and the black pelvic fins with pale bases.

The large-scaled goby was first taken July 26, 1881, in Departure bay by Capt. H. E. Nichols, U.S.N., of the United States Coast and Geodetic Survey steamer *Hassler*. It was a specimen 4 2/5 inches in length, obtained at a depth of 20 fathoms and was described in the same year by T. H. Bean as the type of a new species, *Gobius Nicholsii*, in honour of its discoverer who took a great interest in natural history. The individual was deposited in the United States National Museum. Since then over a dozen specimens have been secured in the bay. A few individuals have also been taken in English and Nanoose bays, in Barkley sound at Ucluelet and in Esperanza inlet on the west coast of Vancouver island, and on June 12, 1935, a specimen was dredged from Skidegate channel, Queen Charlotte islands. Nothing is known concerning the life history but all specimens taken in British Columbia waters have been from depths of 20 fathoms or less.

Range southern California to Queen Charlotte islands.

Fine-scaled goby *Lepidogobius lepidus* (Girard) 1854

Body elongate, slender, terete, depth about 7 in standard length. Head small, subconical; mouth terminal, moderate; maxillary reaching to point below pupil of eye; eye large, diameter about 4 in length of head; no crest on top of head. Fins: dorsal (2), VII—16 to 18; anal, 15 or 16; pelvic, thoracic, united, forming hollow cone free from body; caudal, rounded. Lateral line: absent. Scales: cycloid, very small; covering body and head; in oblique rows above midline of body, about 86. Colour: pale olive green, somewhat mottled with brown on dorsal surface, rayed dorsal, anal and caudal fins; dusky to black on ventral surface of head and on tips of fins.

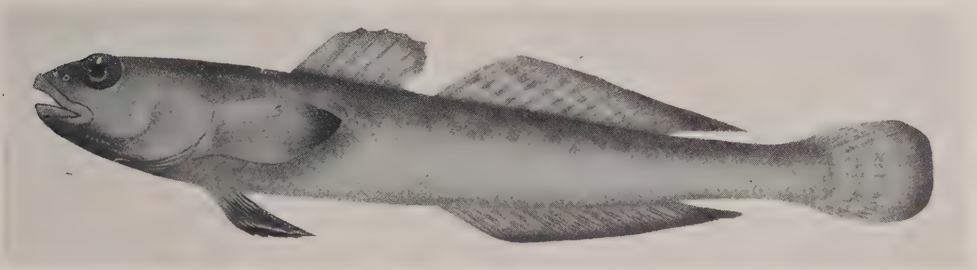

FIGURE 104. Fine-scaled goby. *Lepidogobius lepidus* (Girard) 1854

Length to 4 inches.

Distinguished by the elongate terete body, the conical head, the 86 or so small scales in oblique rows above the midline of the body and the dusky to black coloration on the tips of the fins.

The fine-scaled goby was first recorded from British Columbia waters in 1881, from Victoria, by D. S. Jordan and C. H. Gilbert from a single specimen 4 inches in length as *Lepidogobius gracilis* (Girard). It has been taken at Esquimalt, in Burrard inlet, Howe and Baynes sounds and near Comox. The fine-scaled goby inhabits muddy bottoms from shallow water down to 30 fathoms.

Range southern California to Vancouver island.

Arrow goby *Clevelandia ios* (Jordan and Gilbert) 1882

Body elongate, slender, depth 6 to 7 in standard length, somewhat compressed. Head long; mouth terminal, large; maxillary reaching to point far behind eye; eye small, diameter about 6.5 in length of head; no crest on top of head. Fins: dorsal (2), IV or V—15 to 17; anal, 14 to 17; pelvic, thoracic, large, united, forming hollow cone free from body; caudal, rounded. Lateral line: absent. Scales: cycloid, very small; in oblique rows above midline of body, about 70. Colour: gray to pale, light olive green to tawny, black spotting promiscuous, fine; light orange spots minute, scattered over body without pattern, on dorsal, pectoral and caudal fins forming irregular bars; bright iridescent green spots scattered over body; shining iridescent white opaque spots on sides of body and head; in male, black band on anal fin conspicuous.

Length to 2 inches.

Distinguished by the slender body, the maxillary extending about two-thirds of the length of the head and the bright iridescent spots on the body and the head.

The arrow goby was first taken in British Columbia waters in June, 1880, in Saanich arm, when a specimen two inches in length was obtained from the stomach of a white-spotted greenling, *Hexagrammos stelleri* (recorded as *Hexagrammus asper*), recorded in 1882 by D. S. Jordan and C. H. Gilbert as the type specimen of a new species, *Gobiosoma ios* and deposited in the United States National Museum. In recent years it has been secured in Departure and Taylor bays and from Pender harbour. These fish are found over mixtures of sand and mud in shallow water and are so well camouflaged that they are very difficult to see except when disturbed. By rapid vibrations of their bodies and gill covers they are able to bury themselves in the sand very quickly. Frequently their presence can be detected by the two spurts of water issuing from behind the gill covers.

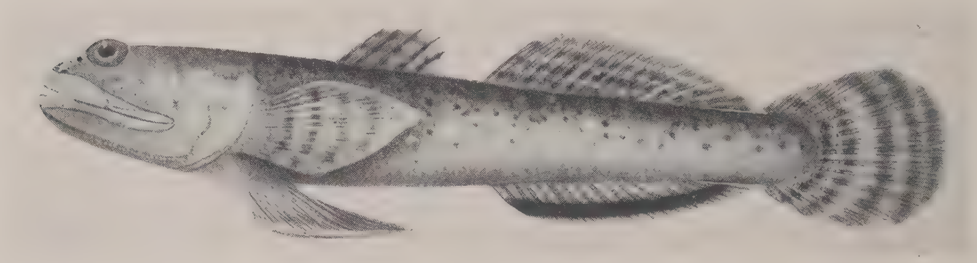

FIGURE 105. Arrow goby. *Clevelandia ios* (Jordan and Gilbert) 1882

Range southern California to strait of Georgia.

Suborder BLENNIOIDEA

The fishes in this suborder have an elongate slender body, usually very elongate, eel-like, compressed. The teeth are small and conical except in the Anarrhichadidae where they are greatly enlarged canines and molars. The dorsal fin is long, usually extending the full length of the body, composed of spines or rays, or both; the dorsal and anal spines or rays correspond to the vertebrae; the pelvic fins, when present, are thoracic, with or without 1 spine and fewer than 5 rays.

In British Columbia waters there are represented eleven families, embracing the wolf-fishes, blennies, eel-pouts, etc.

Family ANARRHICHADIDAE Wolf-fishes

In the wolf-fishes the gill membranes are broadly attached to the isthmus. There is no lateral line. The dorsal fin is composed of spines only; the pelvic fins are absent.

The wolf-fishes are large fishes of northern seas, inhabiting waters of moderate depths. They have a remarkable development of grasping and grinding teeth which enable them to prey upon fishes and crush the hard outer coverings of various invertebrates.

Wolf-eel *Anarrhichthys ocellatus* Ayres 1855

Body greatly elongate, compressed. Head deep, rounded; mouth terminal, large; lips thick, fleshy; teeth on anterior of jaws very strong conical canines, on sides of lower jaw strong molars, on vomer coarse molars in 2 series, on palatines molars in 2 series meeting lateral series of lower jaw; snout short, blunt; eye, small; gill membranes broadly joined to isthmus. Fins: dorsal (1), CCXXX to CCL, long, continuous to posterior end of body, low; anal, 200 to 233, long, continuous to posterior end of body; pelvic, absent; caudal, slender, pointed, separated from dorsal and anal fins by slight notches. Lateral line: absent. Scales: cycloid, minute, embedded in skin. Colour: gray, frequently dark green; sometimes orange in young; black spots round, ocellate, of various sizes, everywhere covering body and dorsal fin; pale on anal fin.

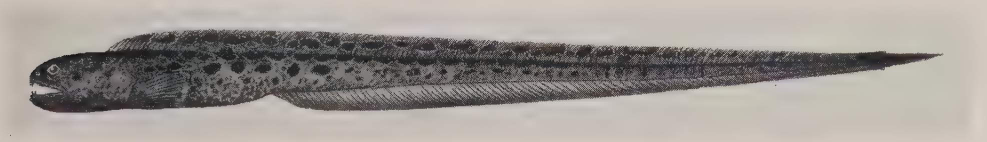

FIGURE 106. Wolf-eel. *Anarrhichthys ocellatus* Ayres 1855

Length to 8 feet.

Distinguished by the absence of pelvic fins, the extremely elongate body, the large canine and molar teeth, the dorsal and anal fins extending to the posterior end of the body, the slender caudal fin separated from the dorsal and the anal fins by slight notches and the gray or green coloration with the large ocellated black spots.

The wolf-eel was first taken in British Columbia waters in 1894 in Juan de Fuca strait near Race rocks when two specimens were obtained, placed in the Provincial Museum, and recorded in 1898 by J. Fannin. The species is caught rather frequently along the coast in salmon-traps, seines and occasionally on hook and line, probably accidentally. The records are from the strait of Georgia, Kyuquot and Hecate strait. The Kyuquot specimen is a young individual about 16½ inches in length and was removed from the stomach of a salmon. In the spring and summer months of 1940, four specimens from the west coast of Vancouver island were on exhibition at the Vancouver Aquarium. The food appears to consist in part of crustaceans, mussels, sea-urchins, sand-dollars and other hard-shelled invertebrates as well as fishes. That the wolf-eel will attack other fishes is shown by the fact that an individual about 4 feet in length was observed to make a violent attack upon a lingcod slightly smaller than itself in an exhibition tank at the Vancouver Aquarium. It seized the lingcod by the middle of the back, tearing the skin and flesh so that the victim died as a result of its injuries.

Range southern California to southeastern Alaska.

Family CLINIDAE Kelp-fishes

In the kelp-fishes the gill membranes are united and free from the isthmus. The lateral line is well developed, decurved anteriorly, straight posteriorly. The dorsal fin usually has elevated anterior and posterior portions and is spinous except for a few rays posteriorly; the vertical fins are not confluent; the pelvic fins are thoracic, with 1 spine and 3 or 4 rays.

The kelp-fishes are small colorful tide-pool fishes of tropical and temperate shores, represented by a single genus in British Columbia waters.

Spotted kelp-fish *Gibbonsia elegans montereyensis* Hubbs 1927

Body elongate, moderately stout, compressed. Head short, pointed; mouth terminal, small; teeth on jaws small; gill membranes united, free from isthmus. Fins: dorsal (1), XXXIV to XXXVI, 5 to 8, usually 6 or 7, long, first four or five anterior spines evenly spaced, high, decreasing in height posteriorly, forming shallow notch with remainder of fin, posterior spines gradually increasing in height posteriorly to height of first ray, rays crowded anteriorly, more widely spaced posteriorly; anal, II, 23 to 28; pelvic, I, 3, thoracic; caudal, rounded. Lateral line: decurved, then straight. Scales: cycloid, minute. Cirri: 2, small, one over each eye; on tips of dorsal spines, minute. Colour: variable, red, brown

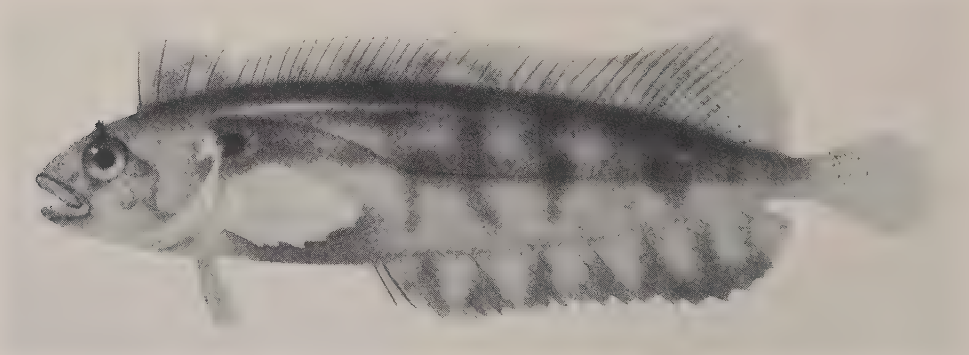

FIGURE 107. Spotted kelp-fish. *Gibbonsia elegans montereyensis* Hubbs 1927

or frequently intense lavender, variously spotted, usually with two well developed brownish black ocelli.

Length to 4 inches.

Distinguished by the elongate dorsal fin with the anterior part of the spinous portion and the rayed portion elevated, the first four or five anterior spines evenly spaced, the last spine approximately the same height as the first ray and the two brownish black ocelli on each side of the body.

The spotted kelp-fish was first taken in British Columbia waters in July, 1909, at Ucluelet, by Messrs. C. H. Young and W. Spreadborough and the 38 specimens obtained were recorded in 1920 by B. A. Bean and A. C. Weed as *Gibbonsia evides* (Jordan and Gilbert). In 1927, C. L. Hubbs re-examined the collection and designated one of the specimens as a paratype of his new subspecies *Gibbonsia elegans montereyensis*. This is a blenny inhabiting tide-pools.

Range southern California to Vancouver island.

Striped kelp-fish *Gibbonsia metzi* Hubbs 1927

Body elongate, moderately stout, compressed. Head short, pointed, mouth terminal, small; teeth on jaws, small; gill membranes united, free from isthmus. Fins: dorsal (1), XXIV to XXVII, 7 to 9, usually 8 or 9, long, first three anterior spines closely approximated, high, decreasing in height posteriorly, forming shallow notch with remainder of fin, posterior spines little elevated, last spine about half height of first ray, rays evenly spaced; anal, II, 24 to 27; pelvic, I, 3, thoracic; caudal, rounded. Lateral line: decurved, then straight. Scales: cycloid, minute. Cirri: 2, small, one over each eye; on tips of dorsal spines, minute. Colour: red or brown, weakly striped with darker shades.

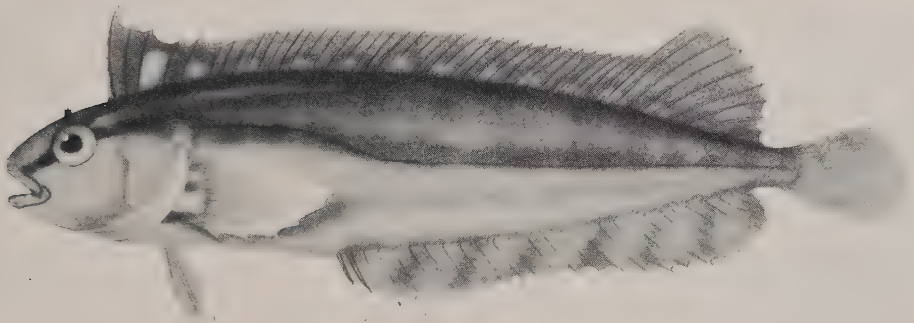

FIGURE 108. Striped kelp-fish. *Gibbonsia metzi* Hubbs 1927

Length to 5½ inches.

Distinguished by the elongate dorsal fin with the anterior part of the spinous portion and the rayed portion elevated, the first three anterior spines closely approximated, the last spine approximately half the height of the first ray and the absence of ocelli.

The striped kelp-fish was first taken in British Columbia waters in July, 1909, at Ucluelet by Messrs C. H. Young and W. Spreadborough and distinguished in 1920 by B. A. Bean and A. C. Weed as different from their *Gibbonsia evides* but not applying any name. Fourteen specimens were obtained. In 1927, C. L. Hubbs pointed out that this second species was actually *Gibbonsia metzi*, which he described in the same paper. On July 10, 1934, two other specimens were obtained on Nootka island at Maquinna point in a beach seine and recorded in 1936 by L. P. Schultz and A. C. DeLacy. This species inhabits shallow water, usually in tide pools.

Range southern California to Vancouver island.

Family XIPHISTERIDAE Belted blennies

In the belted blennies the gill membranes are united and free from the isthmus. The lateral lines are four in number with numerous short vertical extensions. The dorsal fin is composed of spines only; the vertical fins are confluent; the pelvic fins are absent.

The belted blennies are shore fishes of the intertidal zone. The rather uniform body colours blend well with the rocks and seaweeds of their environments.

Belted blenny *Phytichthys chirus* (Jordan and Gilbert) 1880

Body elongate, slender, compressed. Head small; mouth terminal, small, oblique; teeth on jaws small, conical; gill membranes united, free from isthmus. Fins: dorsal (1), LXIX to LXXVIII, long, low, confluent with caudal; anal, II or III, 40 to 50, confluent with caudal; pelvic, absent; pectoral, small, length slightly greater than diameter of eye; caudal, rounded. Lateral lines with numerous vertical branches: 4, lowermost joining that of opposite side anteriorly. Scales: cycloid, small, over entire body. Colour: olive green to olive brown on dorsal surface; yellow to green on ventral surface; frequently with various markings of darker on sides; small white spots on midlateral line, 5 to 7; light and dark streaks diverging backward from eye; green to brown, tinged with yellow, on fins.

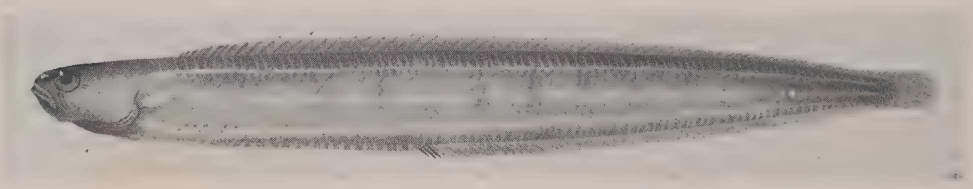

FIGURE 109. Belted blenny. *Phytichthys chirus* (Jordan and Gilbert) 1880

Length to 8 inches.

Distinguished by the absence of pelvic fins, the 4 lateral lines on each side of the body and the 2 or 3 spines and 40 to 50 rays in the anal fin.

The belted blenny was first taken from British Columbia waters on the Queen Charlotte islands by W. H. Osgood who recorded it in 1901 as *Xiphistes chirus*. In June, 1910, a specimen 5½ inches in length was collected at Skidegate by Mr. W. Spreadborough and recorded in 1920 by B. A. Bean and A. C. Weed as *Xiphistes ulvae* Jordan and Starks. The species is common along the entire coast inhabiting the shallow water of the intertidal zone where stones provide lurking places. The food consists largely of red and green algae.

Range southern California to northwestern Alaska.

Rock blenny *Xiphister mucosus* (Girard) 1858

Body elongate, slender, rather deep, compressed. Head small, rather blunt; mouth terminal, small oblique; teeth on jaws small, conical; gill membranes united, free from isthmus. Distance from tip of snout to occiput greater than that from occiput to origin of dorsal fin. Fins: dorsal (1), LXXI to LXXVII, confluent with caudal; anal, 46 to 50, confluent with caudal; pelvic, absent; pectoral minute, length slightly greater than diameter of eye; caudal, rounded. Lateral lines with numerous vertical branches: 4, lowermost joining that of opposite side anteriorly. Scales: cycloid, small, over entire body. Colour: greenish black with several dusky white bars on posterior portion of body; dark bands diverging backward from eye, 2, prominent, pale in centre, margined with black, outside of which sometimes pale streak.

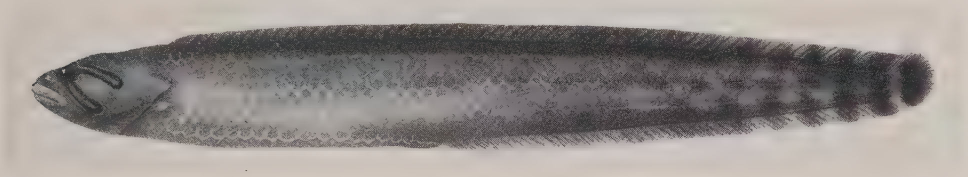

FIGURE 110. Rock blenny. *Xiphister mucosus* (Girard) 1858

Length to 20 inches.

Distinguished by the absence of pelvic fins, the 4 lateral lines on each side of the body, the absence of spines from the anal fin, the distance from the tip of the snout to the occiput greater than the distance from the occiput to the origin of the dorsal fin and the dark bands with pale centres diverging from each eye.

The rock blenny was first recorded from British Columbia waters in 1898 by J. Fannin as *Xiphister mucosus* Girard, based on a specimen in the Provincial Museum. In 1893 two individuals were obtained from Vancouver island by Mr. J. Macoun and recorded in 1920 by B. A. Bean and A. C. Weed as *Xiphidion mucosum* Girard. The species was listed in 1901 from the Queen Charlotte islands by W. H. Osgood as *Xiphidion umcosum* (evidently a misprint for *mucosum*).

The rock blenny is common along the coast, the young being taken frequently beneath rocks in the upper intertidal zone and the adults in the lower intertidal zone to a depth of at least 10 fathoms. It is the largest of the shore blennies. The food consists largely of algae.

Range southern California to southeastern Alaska.

Black blenny *Epigeichthys atro-purpureus* (Kittlitz) 1858

Body elongate, slender, compressed. Head small, pointed; mouth terminal, small, oblique; teeth on jaws small, conical, outer row somewhat enlarged; gill membranes united, free from isthmus. Distance from tip of snout to occiput less than from occiput to origin of dorsal fin. Fins: dorsal (1), LXV to LXVIII, confluent with caudal; anal, 40 to 50, confluent with caudal; pelvic, absent; pectoral, minute, length slightly less than diameter of eye; caudal, rounded. Lateral lines with numerous vertical branches: 4, lowermost joining that of opposite side anteriorly. Scales: cycloid, small, over entire body. Colour: reddish brown to black; dark to black bands diverging backward from eye, 3, prominent, each conspicuously and sharply margined with narrow white to light olive lines; white bar across base of caudal fin extending onto dorsal and anal fins, prominent.

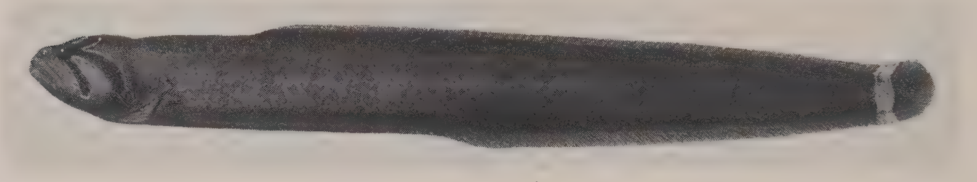

FIGURE 111. Black blenny. *Epigeichthys atro-purpureus* (Kittlitz) 1858

Length to 12 inches.

Distinguished by the absence of pelvic fins, the 4 lateral lines on each side of the body, the absence of spines from the anal fin, the distance from the tip of the snout to the occiput less than the distance from the occiput to the origin of the dorsal fin and the dark bands with narrow white margins diverging from each eye.

The black blenny was first recorded from British Columbia waters in 1881 by T. H. Bean as *Xiphister rupestris* Jordan and Gilbert, based on a specimen from Vancouver island collected by Mr. S. W. Hewson. In the following year T. H. Bean recorded the species under the same name from Alert bay, Alaska (evidently British Columbia), taken in February, 1882, by Dr. Wm. Jones. In 1885 a specimen was collected in Discovery passage by Dr. G. M. Dawson and recorded in 1920 by B. A. Bean and A. C. Weed as *Xiphidon rupestre* (Jordan and Gilbert). The black blenny occurs along the entire coast in shallow water and is often found under rocks well up on the beach when the tide recedes. It is more frequently observed in the intertidal zone than is the rock blenny which it closely resembles.

Range southern California to northwestern Alaska.

Family PHOLIDAE Gunnels

In the gunnels the gill membranes are united and free from the isthmus. The lateral line is short or absent. The dorsal fin is low and supported by spines only; the vertical fins are confluent; the pelvic fins, when present, are thoracic with 1 spine and 1 or 4 rays.

The gunnels are brightly coloured blennies inhabiting the eel-grass and rockweed areas of the intertidal zone.

Ornamented blenny *Chirolophis nugator* (Jordan and Williams) 1895

Body elongate, moderately slender, compressed. Head short, blunt; mouth terminal, small, oblique; lips thick; teeth on jaws, small; gill membranes united, free from isthmus; gill filaments thin, plate-like, bearing on each side series of numerous leaflets. Fins: dorsal (1), LIII to LV, slightly joined to caudal; anal, I, 37 to 42, free from caudal; pelvic, I, 4, thoracic; caudal, rounded. Lateral line: shorter than length of pectoral fin; pores about 10. Scales: cycloid, small, embedded. Cirri: numerous, low, slender, fleshy, covering top of head, extending backward to first spine of dorsal fin. Colour of male: brown, sometimes with reddish tinge, variable; pale cross bars in series on lower half of body, lighter markings fainter on upper half; light on lower part of head with numerous brown streaks; black spots margined with yellow rings (ocelli), on dorsal fin, 12 or 13, conspicuous; white on pelvic fins; brownish dots in rows forming bars on other fins. Colour of female: nearly plain brown on body; dark bars on dorsal fin instead of ocelli as in male.

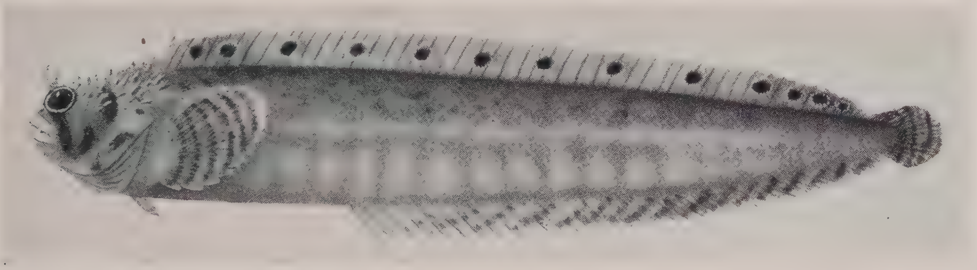

FIGURE 112. Ornamented blenny. *Chirolophis nugator* (Jordan and Williams) 1895

Length to 4¾ inches.

Distinguished by the cirri on the top of the head and extending only onto the first spine of the dorsal fin, the anal fin with 1 spine and 37 to 42 rays, the numerous narrow brown streaks on the lower part of the head and the ocelli on the dorsal fin of the male.

The ornamented blenny was first taken in British Columbia waters April 20, 1912, at Snake island near Departure bay. This was a small male specimen and it is now in the fish collection of the Pacific Biological Station. Four other individuals were obtained in May, 1934, south of Nanaimo on the reef at False narrows. An examination of the gill filaments of this species disclosed the fact that their structure was similar to that of *Chirolophis polyactocephalus*, therefore the genus should be known as *Chirolophis* instead of *Bryostemma*. This is a small species found under rocks in the intertidal zone. It is strikingly marked and one of the handsomest of the blennies.

Range northern California to strait of Georgia.

Decorated blenny *Chirolophis polyactocephalus* (Pallas) 1811

Body elongate, moderately slender, compressed. Head short, blunt; mouth terminal, small, oblique; lips thick; teeth on jaws, small; gill membranes united, free from isthmus; gill filaments thin, plate-like, bearing on each side series of numerous leaflets. Fins: dorsal (1), LXI or LXII, slightly joined to caudal; anal, I, 44 to 61, free from caudal; pelvic, I, 4, thoracic; caudal, rounded. Lateral line: shorter than length of pectoral fin; pores, 6 to 15. Scales: cycloid, small, embedded. Cirri: numerous, high, plumose, fleshy, covering top of head, extending backward to first 4 to 8 spines of dorsal fin. Colour: pale brown, with white to cream markings; light areas on upper half of body, irregular to almost pentagonal with dark centres; white bars in series on lower half of body; dark band extending downward from eye to lower margin of cheek, thence backward, prominent; black bars on dorsal, anal and caudal fins prominent, on pectoral fins, faint; on pelvic fins, dusky white.

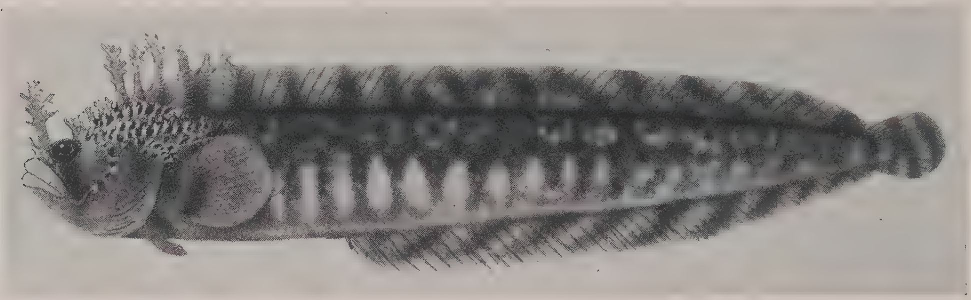

FIGURE 113. Decorated blenny. *Chirolophis polyactocephalus* (Pallas) 1811

Length to 16½ inches.

Distinguished by the numerous plumose cirri on the top of the head and extending onto the first 4 to 8 spines of the dorsal fin, the anal fin with 1 spine and 44 to 61 rays and the general coloration.

The decorated blenny was first taken in British Columbia waters in November, 1890, at Alert bay, by Mr. Spencer. This was a specimen 14½ inches in length, deposited in the Provincial Museum at Victoria and recorded in 1891 by Ashdown Green as *Chirolophus polyactocephalus*. In 1903 D. S. Jordan and J. O. Snyder described *Bryostemma decoratum* and expressed the opinion that all specimens previously referred to as *Chirolophus* or *Bryostemma polyactocephalus*, taken on the northeastern shores of the Pacific ocean, should be considered as *Bryostemma decoratum*. In 1942, P. J. Schmidt pointed out that the peculiar structure of the gill filaments of this species were of the nature of those described by Swainson for the genus *Chirolophis*, hence the scientific name should be *Chirolophis polyactocephalus* (Pallas). Individuals have also been secured in the following localities: Juan de Fuca strait, English bay, Burrard inlet, Stuart island, Alert bay and Prince Rupert harbour. The species has been secured at depths ranging from 10 to 50 fathoms.

Range Puget sound to northwestern Alaska.

Saddled blenny *Pholis ornatus* (Girard) 1854

Body elongate, moderately slender, compressed. Head small, compressed; mouth terminal, small, oblique; teeth small, conical; gill membranes broadly united, free from isthmus. Fins: dorsal (1), LXXIV to LXXIX, confluent with caudal; anal, II, 35 to 38, confluent with caudal; pelvic, I, 1, thoracic, minute; pectoral small, length about half that of head; caudal, rounded. Lateral line: absent. Scales: cycloid, very small. Colour: olive green to brown on dorsal surface; yellow, orange or red on ventral surface; dark bar across head behind eyes; dark bar downward from eye; dusky bars in series across sides of body; black markings in series along base of dorsal fin "V" to "U"-shaped, enclosing dark green or brown areas darker than body colour; orange sometimes on pectoral, anal and caudal fins; light green with series of white bars on anal fin in some specimens.

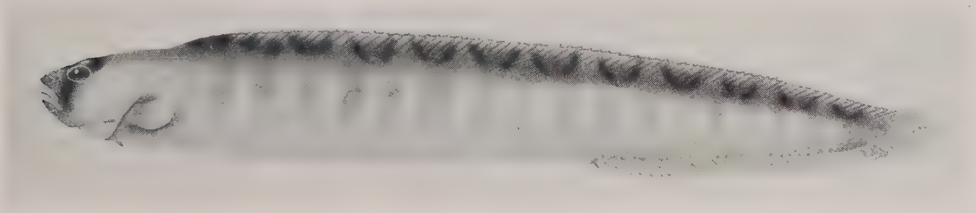

FIGURE 114. Saddled blenny. *Pholis ornatus* (Girard) 1854

Length to 12 inches.

Distinguished by the series of "V" to "U"-shaped black markings along the base of the dorsal fin and the presence of the minute pelvic fins thoracic in position each with 1 spine and 1 ray.

The saddled blenny was first recorded from British Columbia waters in 1861 from Vancouver island by A. Günther as *Centronotus nebulosus* on the basis of 3 specimens collected by Lieut.-Col. Hawkins of H.M.S. *Plumper*. The species was listed in 1898 by J. Fannin as *Muraenoides ornatus* on the basis of an individual in the Provincial Museum. (Many of the records of *Pholis ornatus* may be confused with the following species, *Pholis laetus*, because of the fact that over a considerable period of years the two species were considered identical and were recorded as *P. ornatus*.) The first definite locality record from these waters is that of a single individual taken in 1885 in Houston Stewart channel by Dr. G. M. Dawson and recorded in 1920 by B. A. Bean and A. C. Weed. Specimens have been taken at Fort Rupert, Union bay, Departure bay, Burrard inlet and Victoria. The saddled blenny occurs frequently near the mouths of streams on muddy bottoms at depths between 10 and 20 fathoms although it is found occasionally in the intertidal zone. It feeds upon small crustaceans and molluscs.

Range northern California to southeastern Alaska.

Bracketed blenny *Pholis laetus* (Cope) 1873

Body elongate, moderately slender, compressed. Head small, compressed; mouth terminal, small, oblique; teeth small, conical; gill membranes united, free from isthmus. Fins: dorsal (1), LXXIV to LXXX, confluent with caudal; anal, II, 35 to 37, confluent with caudal; pelvic, I, 1, thoracic, minute; pectoral, small, length 2.2 to 3 in that of head; caudal, rounded. Lateral line: absent. Scales: cycloid, very small. Colour: yellowish green darker on dorsal surface; slightly mottled on sides; black markings in series along base of dorsal fin, bracket-shaped, enclosing orange or yellow areas; light area on top of head, "V"-shaped, narrowly margined with black; green spot sometimes on opercle; orange on anal fin, sometimes on caudal fin.

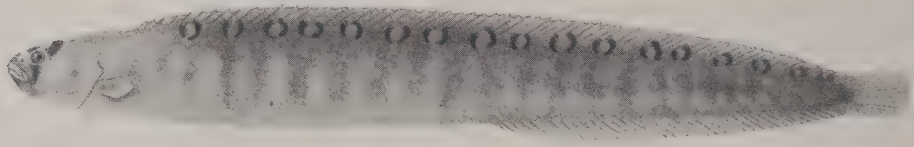

FIGURE 115. Bracketed blenny. *Pholis laetus* (Cope) 1873

Length to 10 inches.

Distinguished by the series of bracket-shaped black markings along the base of the dorsal fin and the presence of the minute pelvic fins thoracic in position each with 1 spine and 1 ray.

The bracketed blenny was first taken in British Columbia waters in 1903 by the *Albatross* as follows: June 23, at Union bay; June 25, at Fort Rupert; July, at Metlakatla near Port Simpson. These specimens were recorded in 1907 by B. W. Evermann and E. L. Goldsborough as *Pholis ornatus*, although figuring *Pholis laetus*. Re-examination of the collections from these localities by Dr. L. P. Schultz revealed the presence of *P. laetus* as indicated above, and *P. ornatus* at Union bay and Fort Rupert. The bracketed blenny is common along the coast in shallow water, being found frequently in the intertidal zone, around seaweeds and rocks, in tide-pools and occasionally down to 30 or 40 fathoms. It has been taken in Burrard inlet, Departure bay, Nootka island, Massett inlet and Prince Rupert harbour and apparently is more common northward.

Range northern California to northwestern Alaska.

Fucus blenny *Xererpes fucorum* (Jordan and Gilbert) 1880

Body elongate, slender, compressed. Head small; mouth terminal, small, oblique; teeth small, conical; crest on head, low; gill membranes united, free from isthmus. Fins: dorsal (1), LXXXIII or LXXXIV, confluent with caudal; anal, II, 32 to 38, confluent with caudal, spines small, first short, enlarged, rounded, not channeled on anterior surface, only partially included in very slight pouch; pelvic, absent; pectoral, very small; caudal, rounded. Lateral line: absent. Scales: cycloid, small. Colour: bright green to deep red; dark spots sometimes along midline of body in series; dark bar downward from eye, narrow.

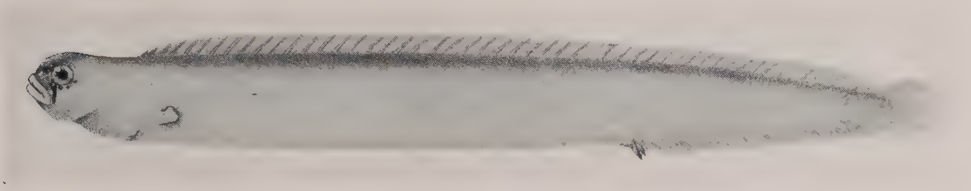

FIGURE 116. Fucus blenny. *Xererpes fucorum* (Jordan and Gilbert) 1880

Length to 9 inches.

Distinguished by the uniform bright green to deep red coloration, the short stout round spine in the anal fin partially enclosed in a sheath and the absence of pelvic fins.

The fucus blenny was first taken in British Columbia waters in June, 1909, at Ucluelet and recorded in 1920 by B. A. Bean and A. C. Weed. In June and July, 1934, specimens were collected from Vargas and Nootka islands. A single individual was obtained July 10, 1936, in the stomach of a Farralone cormorant found at Bare island near Victoria, and another on June 20, 1943, at Comox by shore collecting. This exceedingly active blenny appears to occur most frequently in masses of the seaweed, *Fucus*, commonly known as bladderweed or rockweed. Its food includes small crustaceans and molluscs.

Range southern California to Vancouver island.

Pen-point blenny *Apodichthys flavidus* Girard 1854

Body elongate, moderately slender, compressed. Head small, compressed; mouth terminal, small, oblique; teeth small, conical; crest on head, low; gill membranes united, free from isthmus. Fins: dorsal (1), XC to XCIV, confluent with caudal; anal, I, 38 to 42, confluent with caudal, spine very large, pen-point shaped, deeply excavated on anterior surface, very convex behind, thin, flexible, with sharp edges, entirely included in pouch of skin; pelvic, absent; pectoral, length about 2.5 in that of head; caudal, rounded. Lateral line: absent. Scales: cycloid, small. Colour: vivid green, yellow, orange, brown or red; light spots frequently along midline of body, in series; silvery line from middle of maxillary through lower part of eye to nape or to opercle, narrow, margined with orange and black; dark bar downward from eye, narrow.

Length to 18 inches.

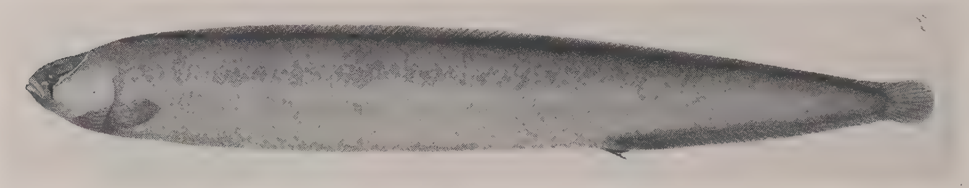

FIGURE 117. Pen-point blenny. *Apodichthys flavidus* Girard 1854

Distinguished by the vivid green to red coloration with the silvery line across each side of the head, the pen-point shaped spine in the anal fin and the absence of pelvic fins.

The pen-point blenny was first taken in British Columbia waters by H.M.S. *Plumper* in the strait of Georgia, and was recorded in 1861 by A. Günther who stated that the specimen, a female, was presented to the British Museum by the Lords of the Admiralty. The first definite locality record is that of a specimen taken in 1895 in Active pass by Prof. E. E. Prince and recorded in 1920 by B. A. Bean and A. C. Weed. Distribution probably is general along the coast as it is common in the strait of Georgia and has been recorded from Victoria, Ucluelet, Vargas island, Clayoquot sound and the Queen Charlotte islands. Its brilliant uniform colour of green or yellow green admirably blends with its eel-grass habitat. The food consists of small crustaceans and molluscs.

Range southern California to southeastern Alaska.

Family STICHAEIDAE Northern blennies

In the northern blennies the gill membranes are united and either free from, or joined to, the isthmus (joined in British Columbia species). The lateral line is single, faint and marked by a series of minute pores. The dorsal fin usually is supported by spines only but sometimes with a few rays posteriorly; the vertical fins are confluent, or nearly so; the pelvic fins, when present, are thoracic with 1 spine and 3 or 4 rays.

The northern blennies inhabit the cold waters of the northern oceans. They occur from the intertidal area to depths of at least 200 fathoms and are bottom dwellers.

Crested blenny *Anoplarchus purpurescens* Gill 1861

Body elongate, slender, compressed. Head small; mouth terminal, moderate, oblique; lower jaw included; lips fleshy; teeth: on jaws, small, conical; on vomer and palatines, minute, in bands; crest on top of head, fleshy; gill membranes united, joined to isthmus. Fins: dorsal (1), LIV to LX, long, slightly joined to caudal; anal, 35 to 39, free from caudal; pelvic, absent; pectoral, moderately large, length about twice diameter of eye; caudal, rounded. Lateral line: faint, visible as row of spaced pores. Scales: cycloid, small; on posterior half of body; absent from anterior half. Colour: in male, dark gray, purple or black, sometimes bright red; bright red to orange on anal fin; in female, gray, variously marked with brownish gray reticulations and spots; dull gray on anal fin; in both sexes, black bar obliquely downward and backward from eye across preopercle, light bar parallel and above black bar margined with sharp red line; live green on dorsal fin with 1 to 3 black spots anteriorly; pale gray to white band across caudal peduncle sharply defined.

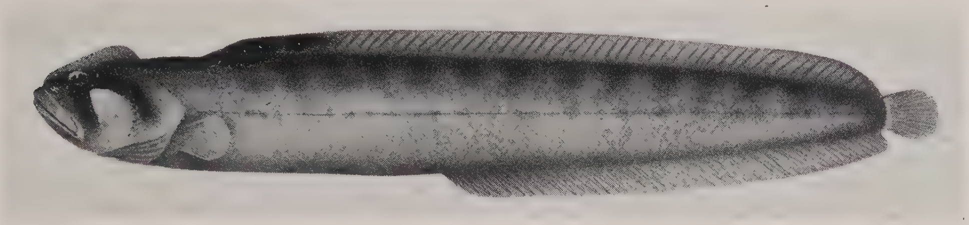

FIGURE 118. Crested blenny. *Anoplarchus purpurescens* Gill 1861

Length to 7¾ inches.

Distinguished by the absence of pelvic fins, the presence of a fleshy crest on the top of the head, the scales on the posterior half of the body only and the pale sharply defined band across the base of the caudal fin.

The crested blenny was first recorded from British Columbia waters in 1861 from Vancouver island and the mouth of the Fraser river by A. Günther as *Centronotus crista galli.* The specimens were collected by Lieut.-Col. Hawkins during the voyage of H.M.S. *Plumper.* In 1881 T. H. Bean recorded two individuals from the east side of Campbell island (Port McLaughlin), collected by Capt. H. E. Nichols, as *Anoplarchus atropurpureus* (Kittlitz). This blenny is very common along the coast, occurring under rocks in the intertidal zone. Spawning takes place in very late winter or early spring. The female deposits the eggs under and between stones in a mass which usually has the form of a truncated cone containing as many as 3,000 eggs and then coils her body about them to provide protection. The eggs are small, about 1/16 of an inch in diameter, at first white, later becoming gray and showing a yellowish oil globule.

Range northern California to northwestern Alaska.

Wry-mouth *Delolepis giganteus* Kittlitz 1858

Body greatly elongate, compressed. Head oblong, flattened above; mouth terminal, large, oblique; lower jaw projecting; maxillary extending one diameter of eye behind eye; teeth: on jaws small, bluntly conical, sharp; on vomer, few; on palatines in two rows, outer larger; snout short, blunt; no crest on top of head; eye very small, high; gill membranes united, joined to isthmus. Fins: dorsal (1), LXXIII to LXXVII, confluent with caudal; anal, II, 43 to 49, confluent with caudal; pelvic, absent; pectoral, moderately large, length about three times diameter of eye; caudal, pointed to rounded. Lateral line: faint, pores closely spaced. Scales: cycloid, small; on posterior half of body; absent from anterior half except for row on lateral line. Colour: pale brown, tinged with yellow and violet; lighter on ventral surface; markings somewhat variable; one colour phase with dark stripe along base of dorsal fin, dark above and below lateral line with pale area between; irregular dark spots in series above and below bands; other phase almost uniform light fawn, dark band along lateral line; colour phases not sexual.

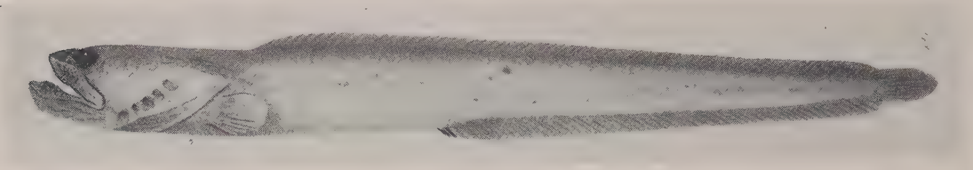

FIGURE 119. Wry-mouth. *Delolepis giganteus* Kittlitz 1858

Length to 3 feet 10 inches.

Distinguished by the absence of pelvic fins, the projecting lower jaw, the maxillary extending well behind the eye, the scales on the posterior half of the body and the pale brown coloration with the dark bands along the sides of the body.

The wry-mouth was first taken in British Columbia waters August 2, 1881, at the head of Kingcome inlet in 18 fathoms, by Capt. H. E. Nichols, and described in the same year by T. H. Bean as the type of a new genus and species, *Delolepis virgatus*, now considered to be synonymous with *D. giganteus*. This fish has been captured along the coast at Barkley sound, Victoria, Nanaimo, English bay, Comox, Pender harbour, Alert and Hardy bays. Most of these individuals were taken on set-lines and in trawls at depths from 18 to 70 fathoms.

Range Oregon to northwestern Alaska.

Red devil *Lyconectes aleutensis* Gilbert 1895

Body elongate, slender, slightly compressed. Head short, blunt, rather square in cross section; mouth terminal, moderate; jaws almost vertical; lower jaw projecting; maxillary extending to point below eye; teeth: on jaws small, bluntly conical; on vomer, 2 or 3, bluntly rounded; on palatines, none; nostril tube long, overhanging upper lip; eye very small, high; gill membranes united, joined to isthmus. Skin: loose. Fins: dorsal (1), LX to LXIX, confluent with caudal, tips of spines slightly projecting; anal, II, 45 to 49, confluent with caudal, spines weak; pelvic, absent; pectoral, small; caudal, rounded. Lateral line: faint, visible as row of spaced pores. Scales: absent. Colour: completely red in life due to blood in transparent skin; dull gray in preservative.

Length to 8½ inches.

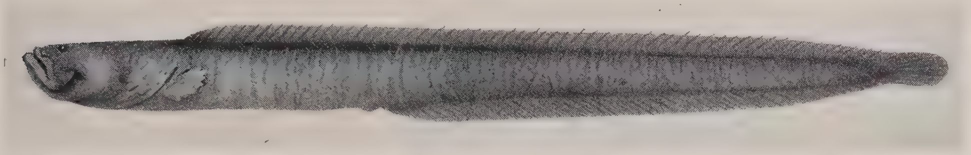

FIGURE 120. Red devil. *Lyconectes aleutensis* Gilbert 1895

Distinguished by the absence of pelvic fins, the almost vertical jaws, the projecting lower jaw, the maxillary not extending behind the eye, the loose transparent skin, the naked body and the red coloration.

The red devil was first taken in British Columbia waters February 22, 1934, off Pender island. The specimen was discovered by Mr. J. Shannon in the stomach of a cod, *Gadus macrocephalus*, captured in an otter trawl operated at a depth of about 40 fathoms. Two other individuals are known from these waters taken in 1936 and 1941 in English bay by shrimp trawlers. This fish apparently inhabits muddy bottoms as indicated by the places of capture, the nature of the skin and the position of the eyes. In California waters it has been found as deep as 191 fathoms.

Range northern California to northwestern Alaska.

Family LUMPENIDAE Eel-blennies

In the eel-blennies the gill membranes are usually united, attached far forward to the isthmus, with or without a free fold posteriorly. The lateral line is indistinct or absent. The dorsal fin is low and supported by spines only, which sometimes project slightly beyond the margin of the membranes; the vertical fins are not confluent; the pelvic fins are thoracic with 1 spine and 3 or 4 rays.

The eel-blennies usually occur in the waters beyond the intertidal zone down to depths of at least 65 fathoms, and are captured in bottom trawls. The eel-blenny, however, invades shallow water and may be taken in beach-seines and on baited hooks.

Y-blenny *Allolumpenus hypochromus* Hubbs and Schultz 1932

Body elongate, slender, somewhat compressed. Head, short; mouth terminal, small; lower jaw included; teeth small on jaws, absent from vomer and palatines; snout short; gill membranes united, joined to isthmus anteriorly with wide free fold posteriorly. Fins: dorsal (1), XLIX; anal, I, 31; pelvic, I, 3, thoracic; pectoral large, pointed; caudal, rounded. Lateral line: absent. Scales: cycloid, small, covering entire body; absent from head. Colour: in preservative, light brown with dark markings; black markings on sides of body in irregular series, some forming distinct "Y"'s below midline of body; black dots along base of dorsal fin, 5, in series; black spots at base of caudal fin, 2, conspicuous, black bar connecting upper with lower.

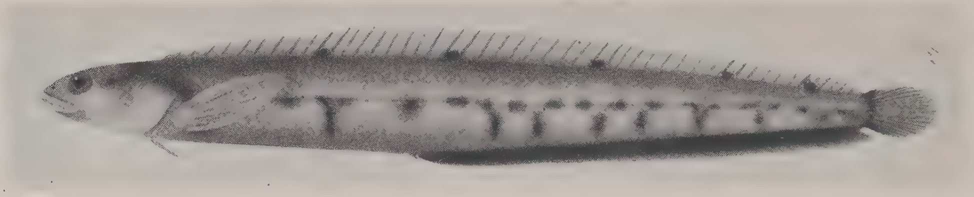

FIGURE 121. Y-blenny. *Allolumpenus hypochromus* Hubbs and Schultz 1932

Length to 2⅞ inches.

Distinguished by the gill membranes joined to the isthmus anteriorly with a wide free fold posteriorly, the dark "Y"-shaped markings along the sides of the body, the large pelvic fins each with 1 spine and 3 rays, the dorsal fin with 49 spines and the anal fin with 1 spine and 31 rays.

The Y-blenny is known from a single specimen, taken August 8, 1927, near Newcastle island, Departure bay, at a depth of 20 fathoms. It was described as the type of a new species in 1932 by C. L. Hubbs and L. P. Schultz. This is the only specimen known and is deposited in the collection of fishes at the Pacific Biological Station, Nanaimo.

Range Departure bay.

Eel-blenny *Lumpenus anguillaris* (Pallas) 1811

Body greatly elongate, very slender, moderately compressed. Head short; mouth terminal, lower jaw included; teeth small on jaws, absent from vomer and palatines; snout short; gill membranes separate, joined to isthmus anteriorly, without free fold posteriorly. Fins: dorsal (1), LXVI to LXXII; anal, I, 45 to 50, spine short, slender, sometimes absent; pelvic, I, 3 or 4, thoracic; pectoral,

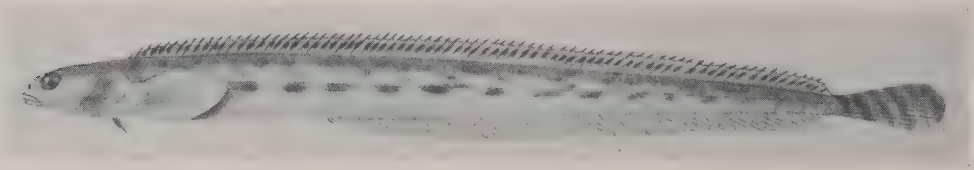

FIGURE 122. Eel-blenny. *Lumpenus anguillaris* (Pallas) 1811

large, pointed; caudal, rounded. Lateral line: straight. Scales: cycloid, covering entire body and head. Colour: light green on dorsal surface; cream on ventral surface; dark green to brown streaks on sides numerous, short; brownish green short bars and dots on dorsal and caudal fins forming rows and bands; plain on other fins; pale on lining of mouth.

Length to 20 inches.

Distinguished by the very elongate body, the gill membranes joined to the isthmus anteriorly without a free fold posteriorly, the anal fin with 1 spine or none and the short dark streaks along the sides of the body.

The eel-blenny was first taken in British Columbia waters in May, 1882, in Esquimalt harbour by Capt. H. E. Nichols and recorded in 1883 by T. H. Bean. Apparently it is common along the coast having been captured at Victoria, Ucluelet, strait of Georgia (including Stuart channel, English bay, Burrard inlet, Howe sound and Comox), and Massett inlet, from shallow water to 50 fathoms. It will take marine worms as bait.

Range northern California to northwestern Alaska.

White-barred blenny *Poroclinus rothrocki* Bean 1890

Body elongate, slender, compressed. Head short; mouth terminal, small; lower jaw included; teeth small on jaws, vomer and palatines; snout short; eye large; gill membranes united, joined to isthmus anteriorly, without free fold posteriorly. Fins: dorsal (1), LVII to LXVII, membrane of last spine slightly joined to base of uppermost ray of caudal; anal, III, 40 to 44, second spine longer and stronger than third; pelvic, I, 3, thoracic, spine short, sharp, rays relatively long; pectoral broad, rounded; caudal, pointed. Lateral line: faint, straight. Scales: cycloid, small; covering body and cheeks. Colour: light brown on dorsal surface; white on ventral surface; white vertical bars margined with brown in series on each side of body above lateral line, 10 to 12, confluent with white of ventral surface; pale cream on lining of mouth.

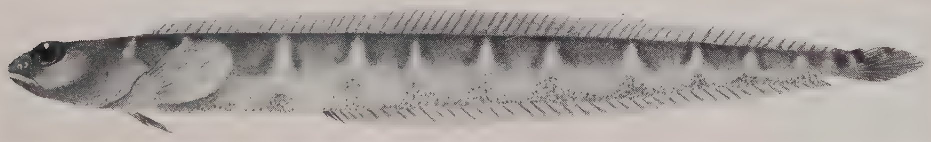

FIGURE 123. White-barred blenny. *Poroclinus rothrocki* Bean 1890

Length to 10 inches.

Distinguished by the pelvic fins each with 1 short spine and 3 long rays, the gill membranes joined to the isthmus anteriorly without free fold posteriorly, the anal fin with 3 spines and the white vertical bars along the sides of the body.

The white-barred blenny was first taken in British Columbia waters April 6, 1929, in Burrard inlet at Deep cove, by Dr. A. A. Berkeley Needler who obtained one specimen from a shrimp trawl operating at a depth of probably 50 fathoms or more. Other individuals have been secured as follows: one June 10, 1935, in Rennell sound, Queen Charlotte islands, at a depth between 60 and 70 fathoms; two in 1939, near Porlier pass in an otter trawl at a depth of about 25 fathoms; and three in 1941, in shrimp trawls in Burrard inlet.

Range southern California to northwestern Alaska.

Long-snouted blenny

Lumpenella longirostris (Evermann and Goldsborough) 1907

Body elongate, slender, compressed. Head short; mouth terminal, small; lower jaw included; teeth small on jaws, absent from vomer and palatines; snout long; cheek somewhat inflated; gill membranes united, joined to isthmus anteriorly, without free fold posteriorly. Fins: dorsal (1), LXI to LXXI, spines stiff; tips exposed; anal, III to V, 36 to 42; pelvic, I, 3, thoracic, small, spine short, length about half that of rays, sharp; pectoral, broad, rounded; caudal, rounded. Lateral line: faint, straight. Scales: cycloid, small; covering entire body and head. Colour: bluish brown on dorsal surface; silvery to sooty blue on ventral surface; sooty blue on cheeks, opercles and gill membranes; dusky black on all fins, particularly pectorals, anal and caudal; dusky to black on lining of mouth. Some preserved specimens lose the brown colours, the sides then show irregular dark blotches on paler ground.

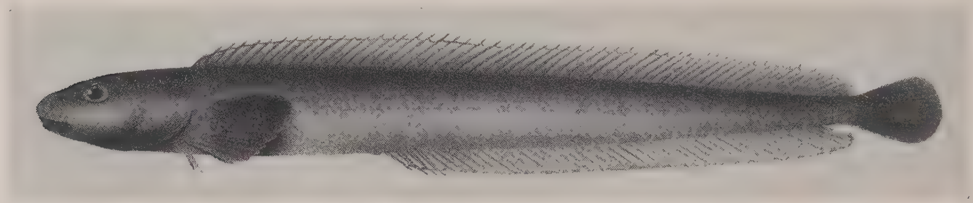

FIGURE 124. Long-snouted blenny. *Lumpenella longirostris* (Evermann and Goldsborough) 1907

Length to 10 inches.

Distinguished by the long blunt snout with the included lower jaw, the inflated cheeks, the stiff spines with naked tips in the long dorsal fin, the anal fin with 3 to 5 spines and the bluish coloration on the body and the blackish coloration on the fins.

The long-snouted blenny was first taken in British Columbia waters January 4, 1929, in Burrard inlet at Deep cove, by Dr. A. A. Berkeley Needler who obtained three individuals in a shrimp trawl at a depth of about 60 fathoms. All records, consisting of nineteen specimens, are from Burrard inlet near the entrance to the North arm at depths from 50 to 65 fathoms. The long-snouted blenny is associated in this area with *Bathyagonus nigripinnis*, *Furcimanus diapterus* and *Lycodes brevipes*. Apparently this is a northern form.

Range Burrard inlet to northwestern Alaska.

Family PTILICHTHYIDAE Quill-fishes

In the quill-fishes the body is extremely elongate, tapering gradually to a short free fleshy portion. The gill membranes are united and free from the isthmus. The lateral line is absent. The dorsal fin is low and spinous anteriorly, high and rayed posteriorly; the pelvic and caudal fins are absent.

The family includes a single species which occurs in the northeastern Pacific.

Quill-fish *Ptilichthys goodei* Bean 1881

Body extremely elongate, slender, tapering gradually posteriorly, ending in short free fleshy portion beyond attenuated vertebral column. Head small; mouth terminal, small; lower jaw greatly projecting to form fleshy tip; teeth on jaws closely set, sharp; gill membranes broadly united, free from isthmus. Fins: dorsal (1), XC, 137 to 145, very long, beginning close behind nape, anterior portion for about half body length composed of very low, stiff spines, tips free, hooked, posterior portion of fin much higher, rays slender, unsegmented, unbranched, connected by membranes; anal, 185 to 196, very long, high, rays slender, unsegmented, unbranched; pelvic, absent; caudal, absent. Lateral line: absent. Scales: absent. Colour: amber green, yellow or orange; dark longitudinal stripe on each side of body on some specimens.

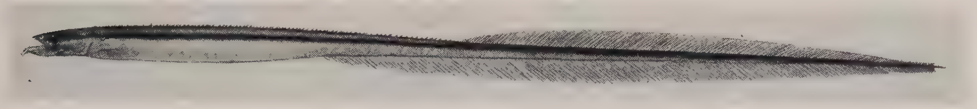

FIGURE 125. Quill-fish. *Ptilichthys goodei* Bean 1881

Length to 13½ inches.

Distinguished by the extremely elongate body ending in a free fleshy portion beyond the attenuated vertebral column, the protruding lower jaw with the fleshy tip, the free hooked tips of the spines in the anterior portion of the dorsal fin and the absence of pelvic and caudal fins.

The quill-fish was first taken in British Columbia waters in August, 1925, off the Nass river at Haystack island in a salmon-trap by Dr. H. C. Williamson who recorded it in 1927. The species has since been secured July 8, 1928, off Porlier pass in Trincomali channel in a beam trawl and July 13, 1935, at Flamingo inlet in a dip-net. Little is known of the life history. These fish may be attracted at night to bright lights suspended over the water, toward which they slowly swim with snake-like undulations. Upon alarm they dart swiftly. The majority of known specimens have been taken at the surface.

Range Puget sound to northwestern Alaska.

Family ZOARCIDAE Eel-pouts

In the eel-pouts the head is elongate; the mouth is moderately large and the upper jaw overhangs the lower; the eyes are placed high on the head. The gill membranes are joined to the isthmus and the gill openings are large. The lateral lines, when present, may be continuous or in two parts. The dorsal and anal fins are supported by rays only and are confluent with the rounded caudal fin; the pelvic fins, when present, are thoracic, small and composed of rays only.

The eel-pouts number about sixty species of which eight occur in British Columbia waters. They are bottom-living, usually in muddy areas at depths between 10 and 1,000 fathoms. Some of the species, possibly all, give birth to young.

Wattled eel-pout *Lycodes palearis* Gilbert 1895

Body elongate, slender, compressed. Head elongate, slightly compressed; snout angular; mouth terminal, large, upper jaw greatly overhanging lower; teeth small on jaws, vomer and palatines; fold of skin overhanging maxillary, prominent; cartilaginous folds on ventral surface of head parallel to mandibles, 2, prominent, ending, anteriorly in wide, free, closely approximated lobes; gill membranes broadly joined to isthmus. Fins: dorsal (1), 94 to 105, confluent with caudal; anal, 83 to 90, confluent with caudal; pelvic, 3, thoracic, small, length 1.25 to 1.5 in diameter of eye; pectoral, entire; caudal, narrow, rounded. Lateral line: faint or absent. Scales: cycloid, small embedded, covering body. Colour: light brown to blue black on dorsal surface; dark margin on dorsal and anal fins, narrow; pale on pelvic fins; in young, white vertical bars across body, sometimes onto anal fin, second white bar entirely in front of dorsal fin; creamy white to pink on peritoneum.

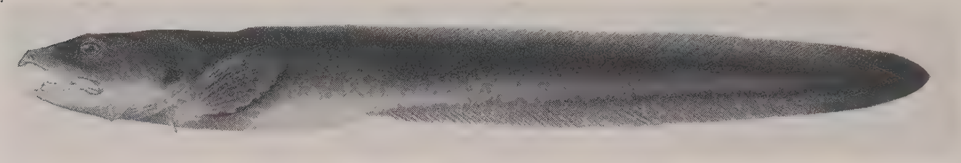

FIGURE 126. Wattled eel-pout. *Lycodes palearis* Gilbert 1895

Length to 15½ inches.

Distinguished by the conspicuous lobed cartilaginous folds on the ventral surface of the head, the small pelvic fins, the angular snout, and in the young the second white bar across the body entirely in front of the dorsal fin.

The wattled eel-pout was first taken in British Columbia waters January 17, 1934, in Active pass by Mr. J. Shannon, who secured a specimen in an otter trawl at a depth of approximately 40 fathoms. This specimen is now in the fish collection of the University of British Columbia. Three other individuals have been secured since in otter trawls, two, February 26, 1941, in Satellite channel between 30 and 50 fathoms, and one, February 27, 1942, in Active pass at 35 fathoms. These captures were recorded in 1945 by G. C. Carl and G. V. Wilby.

Range Puget sound to northwestern Alaska.

Short-finned eel-pout *Lycodes brevipes* Bean 1890

Body elongate, moderately slender, compressed. Head elongate, compressed; snout rounded; mouth terminal, large, upper jaw much overhanging lower; teeth small, on jaws, vomer and palatines; fold of skin overhanging maxillary, moderate; cartilaginous folds on ventral surface of head parallel to mandibles, 2, small moderately conspicuous, without lobes; gill membranes broadly joined to isthmus. Fins: dorsal (1), 85 to 96, confluent with caudal; anal, 74 to 85, confluent with caudal; pelvic, 3, thoracic, minute, length 2.5 to 3 in diameter of eye; pectoral large, broad, entire; caudal, narrow, rounded. Lateral line: faint or absent. Scales: cycloid, small, embedded, covering body. Colour: light brown on dorsal surface; pale to dusky on ventral surface; white vertical bars across body and dorsal fin, 9 to 13, second distinctly behind origin of dorsal fin; dark margin on dorsal and anal fins, narrow; pale on pelvic fins; creamy white to pink on peritoneum.

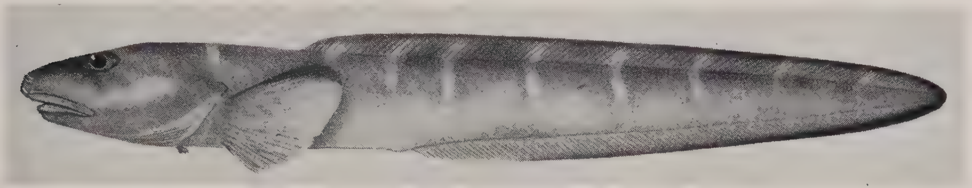

FIGURE 127. Short-finned eel-pout. *Lycodes brevipes* Bean 1890

Length to 10¾ inches.

Distinguished by the moderately conspicuous folds without lobes on the ventral surface of the head, the minute pelvic fins, the rounded snout and the second white cross bar on the body distinctly behind the origin of the dorsal fin.

The short-finned eel-pout was first taken in British Columbia waters June 25, 1903, in Queen Charlotte sound off Fort Rupert by the *Albatross*, station 4201, lat. 50° 45′ N., long. 127° 16′ W., depth 138 fathoms and recorded in 1907 by B. W. Evermann and E. L. Goldsborough. It is probably not uncommon along the coast, particularly in moderately deep water. Specimens have been obtained frequently in English bay and Burrard inlet in shrimp trawls at depths between 15 and 65 fathoms. One individual was found in the stomach of a lingcod caught in the Victoria area.

Range Puget sound to northwestern Alaska.

Black-finned eel-pout *Furcimanus diapterus* (Gilbert) 1891

Body elongate, slender, somewhat compressed. Head elongate; snout rounded; mouth terminal, moderate, upper jaw overhanging lower; teeth small, on jaws, vomer and palatines; fold of skin overhanging maxillary, moderate; gill membranes broadly joined to isthmus. Fins: dorsal (1), 109 to 117, confluent with caudal; anal, 101 to 107, confluent with caudal; pelvic, 3, thoracic, small, length about 2 in diameter of eye; pectoral, large, deeply notched, middle rays much shorter than either upper or lower, rays in lower lobe thickened; caudal, narrow, rounded. Lateral line: single, wavy, passing along lower portion of body, sometimes indistinct. Scales: cycloid, small, embedded, covering body. Colour: dusky brown on dorsal surface; blue black on ventral surface; white punctulations over scales fine, prominent; white vertical bars across side of body, 8 or 9, extending somewhat onto dorsal fin, spreading or furcate on lower portion of side; in adults, bars frequently faint or absent; black on margin of dorsal and anal fins; blue black on pectoral, pelvic and anal fins; blue black on lining of mouth and gill cavity; dusky to black on peritoneum. In male, elongate black blotch anteriorly on dorsal fin.

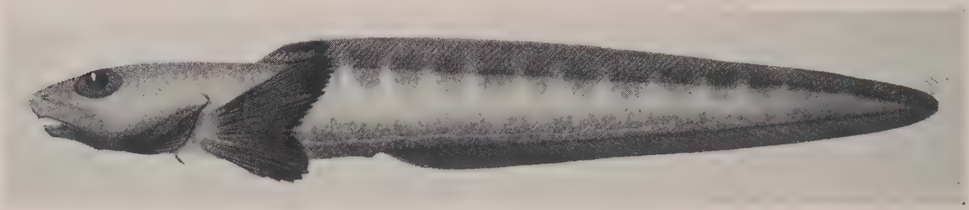

FIGURE 128. Black-finned eel-pout. *Furcimanus diapterus* (Gilbert) 1891

Length to 12½ inches.

Distinguished by the deeply notched pectoral fins, the dark lining on the mouth and gill cavities and the blue black coloration on the ventral surface of the body, the pectoral, pelvic and anal fins.

The black-finned eel-pout was first taken in British Columbia waters June 20, 1903, near Nanaimo by the *Albatross*, station 4198, lat. 49° 19′ N., long. 123° 47′ W., depth 157 fathoms, and recorded in 1907 by B. W. Evermann and E. L. Goldsborough as *Furcimanus diaptera* (Gilbert). The species has since been obtained in English bay, Burrard inlet and Howe sound. The habitat is in the deeper waters with a range from 30 to 391 fathoms. Small numbers are secured in shrimp trawls in Burrard inlet where it is associated with the black-finned sea-poacher, *Bathyagonus nigripinnis*.

Range southern California to northwestern Alaska.

Big-finned eel-pout *Aprodon corteziana* Gilbert 1890

Body elongate, slender, compressed. Head elongate, broad, greatly depressed; snout long, rounded, depressed; mouth terminal, large, upper jaw greatly overhanging lower; teeth small, on jaws and palatines, absent from vomer; fold of skin overhanging maxillary not conspicuous; cartilaginous folds on ventral surface of head parallel to mandibles, 2, little developed, without lobes; gill membranes broadly joined to isthmus. Fins: dorsal (1), 106 to 108, confluent with caudal; anal, about 89, confluent with caudal; pelvic, 3, thoracic, small, length about 1.7 in diameter of eye; pectoral large, margin entire, lower rays thickened; caudal, narrow, rounded. Lateral line: faint. Scales: cycloid, small, embedded, covering most of body, less evident ventrally. Colour: brown to blue black on dorsal surface and sides; lighter on ventral surface; white on scale pockets of body; black blotch on body at base of upper pectoral fin rays; black on anterior border of dorsal fin, on posterior third of pectoral fins and posterior of anal fin and on caudal fin; white on margins of pectoral fins; white to dusky on pelvic fins; white on lining of mouth; dusky on lining of gill cavity; jet black on peritoneum.

Length to 18 inches.

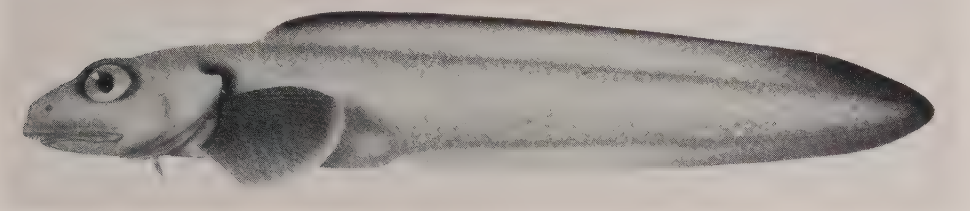

FIGURE 129. Big-finned eel-pout. *Aprodon corteziana* Gilbert 1890

Distinguished by the broad depressed head, the absence of teeth from the vomer, the large entire pectoral fins and the jet black peritoneum.

The big-finned eel-pout was first taken in British Columbia waters in June, 1944, at Barkley sound in an otter trawl at a depth of 50 fathoms by Mr. G. H. Smith and was recorded in 1945 by G. C. Carl and G. V. Wilby. The single specimen, a female, is now in the fish collection of the Provincial Museum at Victoria. This is the only individual known to have been obtained north of California where the species has been reported at depths in excess of 239 fathoms.

Range southern California to Barkley sound.

Black-bellied eel-pout *Lycodopsis pacificus* (Collett) 1879

Body elongate, slender, somewhat compressed. Head elongate, somewhat compressed, larger in male; snout rounded; mouth terminal, moderate; upper jaw overhanging lower; teeth small on jaws, absent from vomer and palatines; fold of skin overhanging maxillary, moderate; gill membranes broadly joined to

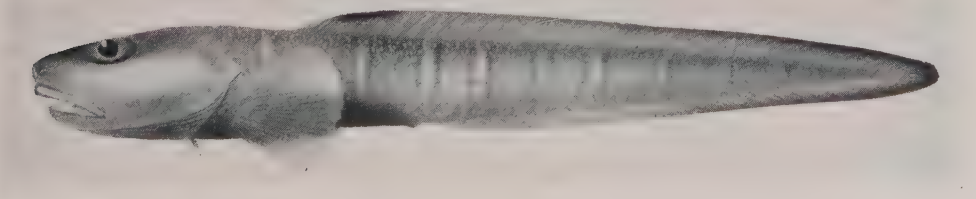

FIGURE 130. Black-bellied eel-pout. *Lycodopsis pacificus* (Collett) 1879

isthmus. Fins: dorsal (1), 90 to 100, confluent with caudal; anal, 70 to 85, confluent with caudal; pelvic, 3, thoracic, small, length about 2 in diameter of eye; pectoral, broad, entire; caudal, narrow, rounded. Lateral line: along midline of body, faint. Scales: cycloid, small, embedded, covering body and vertical fins. Colour: light gray to light reddish brown; light spots where pigment is less dense over scales; light bars vertical, margined with black across body, sometimes faint in adult; black on margin of dorsal fin and elongate spot at anterior end; black on margin at posterior end of anal fin; pale on pelvic fins; jet black on peritoneum.

Length to 18 inches.

Distinguished by the conspicuous jet black peritoneum, the absence of teeth from the vomer and palatines and the elongate black spot on the anterior portion of the dorsal fin.

The black-bellied eel-pout was first recorded from British Columbia waters in 1898 by J. Fannin as *Lycodopsis pacificus* Collett, one of the fishes in the collection of the Provincial Museum at Victoria. This is the commonest member of the family found in these waters. In the strait of Georgia area it is obtained in shrimp trawls, in which it frequently becomes enmeshed, and in otter trawls, at depths between 10 and 120 fathoms, especially on muddy bottoms. The black-bellied eel-pout has been recorded from depths of over 200 fathoms in California waters. The food includes marine worms, crustaceans, small bivalves and brittle-stars.

Range central California to northwestern Alaska.

Soft eel-pout *Bothrocara mollis* Bean 1890

Body elongate, moderately slender, compressed. Head elongate, compressed; snout angular; mouth terminal, slightly oblique; upper jaw overhanging lower; teeth small, on jaws, vomer and palatines; fold of skin overhanging maxillary, moderate; gill membranes joined far forward to isthmus so that gill opening extends well under head. Fins: dorsal (1), 100 to 107, moderately high, confluent with caudal; anal, 89 to 95, confluent with caudal; dorsal and anal fins enveloped anteriorly in soft gelatinous tissue; pelvic, absent; pectoral, entire; caudal, narrow, rounded. Lateral line: in two parts, upper beginning above pectoral fin base passing upward, parallel to back, ending just behind vertical from anus; lower

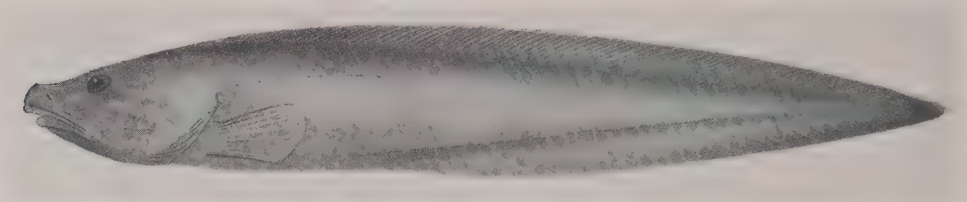

FIGURE 131. Soft eel-pout. *Bothrocara mollis* Bean 1890

commencing on middle of under portion of body about over anus, passing above base of anal fin almost to posterior end of body, frequently becoming faint. Scales: cycloid, minute, covering body and vertical fins. Colour: uniform light brown, semi-translucent; blue or black toward margins of dorsal and anal fins, colour more intense posteriorly; transparent on narrow margins of vertical fins; light on lining of mouth; black on peritoneum.

Length to 18 inches.

Distinguished by the lateral line on each side of the body in two parts, the projecting upper jaw and the absence of pelvic fins.

The soft eel-pout has been taken but once in British Columbia waters, August 29, 1888, off the Queen Charlotte islands near cape St. James, by the *Albatross*, station 2860, lat. 51° 23′ N., long. 130° 34′ W., depth 876 fathoms. This specimen was the type, described in 1890 by T. H. Bean, and is now in the collection of the United States National Museum.

Range southern California to northwestern Alaska.

Pearly eel-pout *Lycodapus fierasfer* Gilbert 1890

Body elongate, slender, somewhat compressed. Head elongate, concave from snout to occiput, viewed laterally; snout angular; mouth terminal, large, oblique; lower jaw slightly projecting; teeth small, on jaws, vomer and palatines; fold of skin overhanging maxillary, moderate; gill membranes joined far forward to isthmus. Skin: on body and bases of fins loose, translucent. Fins: dorsal (1), 82 to 85, moderately high, confluent with caudal; anal, 70 to 74, confluent with caudal; pelvic, absent; pectoral, small, entire; caudal, narrow, rounded. Lateral line: absent. Scales: absent. Colour: absent from skin except for dusting with fine black speckling; jet black on jaws, lining of mouth, gill cavity and peritoneum.

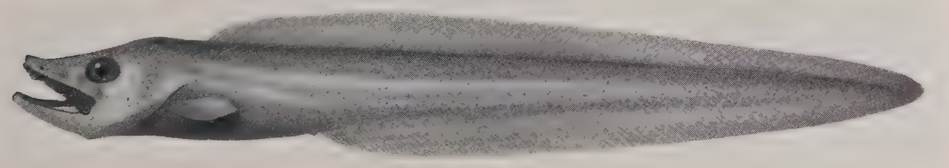

FIGURE 132. Pearly eel-pout. *Lycodapus fierasfer* Gilbert 1890

Length to 6 inches.

Distinguished by the oblique mouth with the projecting lower jaw, the concave lateral view of the head, the translucent skin, the black lining on the mouth, gill cavities and peritoneum and the absence of pelvic fins and scales.

The pearly eel-pout is known from British Columbia waters by a small specimen about 1¼ inches in length taken from the mouth of a black-finned eel-pout, *Furcimanus diapterus*, which was obtained August 29, 1928, in Howe sound at a depth of 120 fathoms in a shrimp trawl. This specimen was recorded in 1932 by C. L. Hubbs and L. P. Schultz and is now in the fish collection at the Pacific Biological Station, Nanaimo. Off the California coast the pearly eel-pout has been found at depths ranging from 27 to 1,076 fathoms.

Range southern California to northwestern Alaska.

Pale eel-pout *Lycodapus mandibularis* Gilbert 1915

Body elongate, moderately slender, compressed. Head elongate, straight from snout to occiput, viewed laterally; snout, rounded; mouth terminal, small; jaws equal; teeth moderately canine-like, on jaws, vomer and palatines; gill membranes joined far forward to isthmus. Skin: on body and bases of fins, loose, translucent. Fins: dorsal (1), 86 to 88, confluent with caudal; anal, 76 to 78, confluent with caudal; pelvic, absent; pectoral, small, entire; caudal, narrow, rounded. Lateral line: absent. Scales: absent. Colour: absent from skin except for sparse and minute speckling with black; speckling more intense posteriorly; black on posterior lining of mouth; dusky on lining of gill cavity; black on peritoneum.

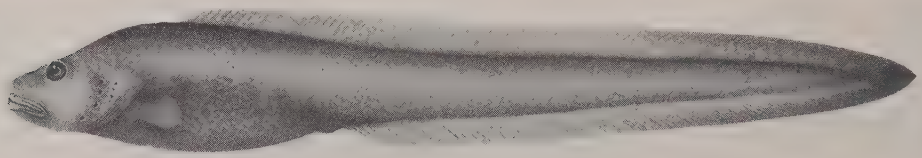

FIGURE 133. Pale eel-pout. *Lycodapus mandibularis* Gilbert 1915

Length to 6¾ inches.

Distinguished by the terminal mouth with the equal jaws, the absence of pelvic fins and scales, the translucent skin and the black lining on the mouth, gill cavities and peritoneum.

The pale eel-pout was taken once in British Columbia waters March 9, 1934, off the northwest coast of Graham island by the International Fisheries Commission, station 1094A, lat. 54° 19′ N., long. 133° 13′ W., in a vertical haul between 116 and 54 fathoms. This specimen was recorded in 1940 by W. M. Chapman as *Bothrocara mollis* Bean, but upon re-examination it was found to be *Lycodapus mandibularis* Gilbert and was recorded as such in 1941 by C. L. Hubbs and L. P. Schultz. In Monterey bay, California, this species has been taken at depths between 32 and 609 fathoms.

Range southern California to Queen Charlotte islands.

Family DEREPODICHTHYIDAE Cusk-pouts

In the cusk-pouts the gill opening is reduced to a small vertical slit in front of the pectoral fin. The lateral line is absent. The dorsal and anal fins are supported by rays only and are confluent with the small pointed caudal fin; the pelvic fins are filamentous, each supported by a minute unbranched ray situated below the eye.

In this family there is but a single species based upon a single known specimen obtained from a great depth off the Queen Charlotte islands.

Cusk-pout *Derepodichthys alepidotus* Gilbert 1895

Body very elongate, slender, terete. Head elongate, terete; snout, rounded; mouth terminal, moderate; upper jaw slightly overhanging lower; teeth small, cardiform, on jaws, vomer and palatines; gill opening reduced to small vertical slit in front of pectoral fin. Skin: thick, enveloping vertical fins, concealing rays.

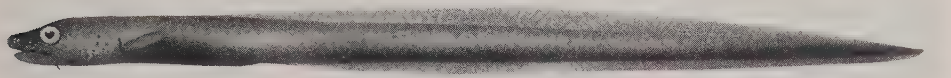

FIGURE 134. Cusk-pout. *Derepodichthys alepidotus* Gilbert 1895

Fins: dorsal (1), long (count unknown), confluent with caudal; anal, long (count unknown), confluent with caudal; pelvic, 1, thoracic, inserted below vertical from posterior margin of eye, fins arising from common base, closely approximated, each reduced to slender unbranched filament; pectoral, slender; caudal, pointed. Lateral line: absent. Scales: absent. Colour: brown on dorsal surface; blue black on ventral surface; soiled white on dorsal and pectoral fins; dark margin on anal fin becoming black posteriorly.

Length to 4½ inches.

Distinguished by the extremely forward position of the minute pelvic fins, the very elongate terete body, the small slit-like gill openings and the absence of scales and lateral lines.

The cusk-pout is known from a single specimen, the type, taken September 3, 1890, west of Moresby island, by the *Albatross*, station 3342, lat. 52° 39′ N., long. 132° 38′ W., depth 1,588 fathoms. This specimen was described in 1895 by C. H. Gilbert and was deposited in the United States National Museum.

Range Queen Charlotte islands.

Family SCYTALINIDAE Burrowing blennies

In the burrowing blennies the gill membranes are united and free from the isthmus. The lateral line is absent. The dorsal and anal fins are confined to the posterior half of the body, composed of rays only, and are confluent with the caudal fin; the pelvic fins are absent.

In this family there is but a single species, the type specimen of which was discovered near cape Flattery in 1880. This blenny is an inhabitant of the intertidal zone and is able to burrow rapidly in the sand or gravel.

Burrowing blenny *Scytalina cerdale* Jordan and Gilbert 1880

Body elongate, moderately slender, deeper behind anus than anteriorly. Head elongate, depressed; mouth terminal, moderate, oblique; lower jaw projecting; teeth small, conical, on jaws, vomer and palatines; eye very small, high on head; cheek distended; gill membranes united, free from isthmus. Fins: dorsal (1), 41 to 51, low, commencing near middle of body, confluent with caudal, rays slender, anterior rays embedded in flesh, not visible without dissection; anal, 36 to 41, confluent with caudal; pelvic, absent; pectoral, very small; caudal, rounded. Lateral line: absent. Scales: absent. Colour: pale pink, finely mottled with pale purple.

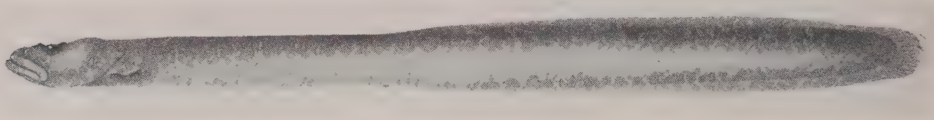

FIGURE 135. Burrowing blenny. *Scytalina cerdale* Jordan and Gilbert 1880

Length to 6 inches.

Distinguished by the elongate scaleless body with the greatest depth in the posterior half, the dorsal and anal fins commencing about the middle of the body of almost equal length confluent with the caudal fin and the absence of pelvic fins.

The burrowing blenny was first taken in British Columbia waters May 31, 1934, off Esteban point by Mr. E. G. Hart, who obtained one individual in a seine. Two other specimens were secured June 13, 1934, off the west coast of Vancouver island, at Maquinna point, Nootka island, and three June 22, 1935, at Moresby island in Kaisun bay. It occurs in tide-pools and on beaches amongst loose gravel and stones and burrows in the sand.

Range southern California to northwestern Alaska.

Family ZAPRORIDAE Prow-fishes

In the prow-fishes the body is stout and compressed. The gill membranes are united and free from the isthmus. The lateral line is absent. The long dorsal fin is supported by spines and the short anal fin by rays, each fin well separated from the broad caudal fin; the pelvic fins are absent.

There is but one species in this family.

Prow-fish *Zaprora silenus* Jordan 1896

Body elongate, stout, compressed; caudal peduncle deep. Head short, broad profile abruptly convex; mouth terminal, small, oblique; lower jaw heavy, slightly projecting; lips thick; teeth small, close-set; snout blunt, high; eye small; gill membranes united, free from isthmus. Fins: dorsal (1), LIV to LVIII, long, high; anal, 24 to 30, short; pelvic, absent; caudal, broad, truncate to rounded.

Lateral line: absent. Scales: cycloid, small, elongate; in oblique rows above midline of body, about 200; on head, except snout and around eye; on basal two-thirds of all fin membranes. Pores: on head numerous, large. Colour: gray to dark green on dorsal surface; lighter on ventral surface; punctulated with dark spots; lemon yellow to orange on sides of head and behind each pectoral fin; dark at base of each pectoral fin, lighter in central portion, black distally, white on margin.

Length to 2 feet 10½ inches.

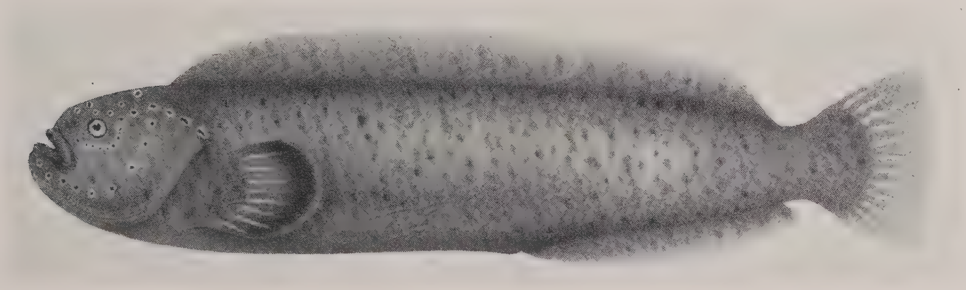

FIGURE 136. Prow-fish. *Zaprora silenus* Jordan 1896

Distinguished by the high blunt snout, the long high dorsal fin, the short anal fin, the absence of pelvic fins, the absence of a lateral line and the large pores on the head.

The prow-fish was first taken in British Columbia waters in November, 1895 in Nanaimo harbour by Mr. George Marsh. Two specimens were obtained, one of which was described in 1896 by D. S. Jordan as the type of the species and both individuals are now in the collection of the Provincial Museum at Victoria. Since this time several specimens have been reported at various points from Juan de Fuca strait to Dixon entrance, some being obtained in pilchard and herring seines. Between May 13, 1930, and June 8, 1932, the International Fisheries Commission took thirty-six small specimens, ranging in length from ½ inch to 3 inches, in plankton-nets operated in waters north and west of British Columbia at depths between 16 and 195 fathoms. While the flesh is firm and the red colour is attractive, this fish is not marketed.

Range Oregon to northwestern Alaska.

Suborder OPHIDIOIDEA

The fishes in this suborder have an elongate body. The teeth are small and villiform. All fins are supported by rays only; the dorsal and anal fins are long, sometimes confluent with the caudal and their rays are more numerous than the vertebrae; the pelvic fins, when present, are thoracic, usually elongate, each with 1 or 2 filamentous rays.

In this suborder are included three families, only one of which, the Brotulidae, is represented in British Columbia waters. The Ophidiidae and Fierasferidae are comprised of tropical fishes which frequently inhabit sea-cucumbers, mollusc shells, etc.

Family BROTULIDAE Brotulids

In the brotulids the body is elongate, compressed and covered with thick lax skin which also envelops the dorsal and anal fins. The pelvic fins are thoracic. The scales, when present, are cycloid, minute and embedded.

The brotulids are closely related to the eel-pouts in spite of various external resemblances to the cods. The species are numerous and diverse in habitat. Some members of the family inhabit great ocean depths, others the shallow coastal waters. Two species have penetrated fresh water in Cuba. These are blind as adults, live in subterranean caves and are viviparous.

The family is represented in British Columbia waters by a single species.

Red brotulid *Brosmophycis marginatus* (Ayres) 1854

Body elongate, compressed. Head elongate, length greater than depth of body; snout bluntly rounded anteriorly; mouth terminal, large, upper jaw slightly overhanging lower; premaxillaries forming entire border of upper jaw; maxillary received under loose fold of skin; teeth small, villiform, in narrow band on premaxillaries, lower jaw, vomer and anterior part of palatines; eye small, diameter about half length of snout; papillae numerous on head, more numerous, larger, on snout and lower jaw; gill membranes united, free from isthmus. Skin: on head, on dorsal and anal fins, lax; everywhere covered with thick mucous secretion. Fins: dorsal (1), 92 to 101, long, low, rays slender; anal, 70 to 72, similar to dorsal; pelvic, 2, thoracic, long, slender, filamentous, outer ray twice length of inner; pectoral, rounded; caudal, narrow, rounded. Lateral line: in two parts, upper highly arched, ending at point above midlateral position, directly above

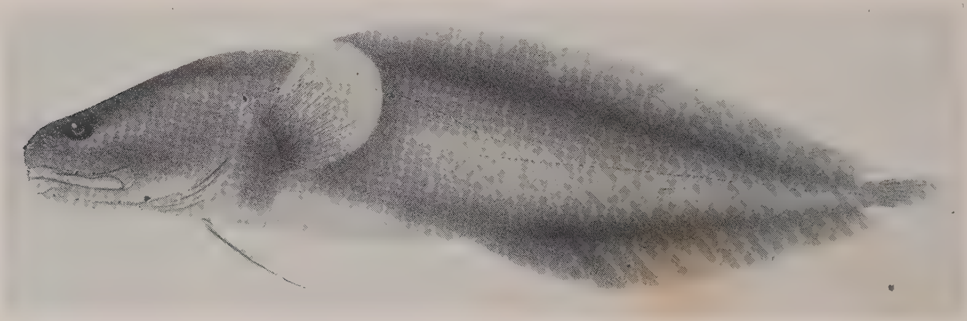

FIGURE 137. Red brotulid. *Brosmophycis marginatus* (Ayres) 1854

anus; lower almost straight, commencing directly below posterior end of first, extending to caudal fin. Scales: cycloid, small, embedded; in oblique rows above midline of body, about 170. Pores: below nostril, 1, large; above upper jaw, 3; along lower jaw, 3; behind lower jaw above isthmus, 1; in angle of dentaries, 1, large; in upper angle of operculum, 1, tubular. Colour: bright red to brown on dorsal surface; nearly white on ventral surface; pale red on ventral surface of head and margins of fins; reddish tinge on entire mucous secretion.

Length to 18 inches.

Distinguished by the pelvic fins thoracic in position each consisting of 2 rays forming a slender filament, the thick mucous secretion on the head and the body, the large pores on the head and the lateral line on each side of the body in two parts.

The red brotulid has been taken once in British Columbia waters, October 11, 1941, in English bay at about 30 fathoms in a shrimp trawl and collected by Mr. P. H. Nasmyth. It is apparently a fish of moderate depths. Nothing is known of its life history.

Range southern California to southeastern Alaska.

Suborder STROMATEOIDEA

The fishes in this suborder have an elongate, compressed body. The posterior part of the pharynx is expanded to form a muscular sac lined with papillae or plications usually bearing teeth.

The suborder comprises four or more families, two of which, the Stromateidae and Centrolophidae, are represented in British Columbia waters.

Family STROMATEIDAE Butter-fishes

In the butter-fishes the body is moderately elongate, deep and strongly compressed. The papillae of the pharyngeal sac have bristle-like teeth. The dorsal and anal fins are long, highest anteriorly, each preceded by 3 spines; the pelvic fins are thoracic and minute or absent in the adult; the pectoral fins are long and falcate; the caudal fin is deeply furcate.

The butter-fishes inhabit the warm open seas. They are highly attractive in their form and bright coloration and are much prized because of their excellent flavour.

California pompano *Peprilus simillimus* (Ayres) 1860

Body elongate, deep, greatly compressed; caudal peduncle short, slender. Head rounded in profile; mouth terminal, small; teeth: on jaws minute, weak; on pharyngeal papillae, bristle-like; snout bluntly rounded; gill membranes united, free from isthmus. Fins: dorsal (1), III, 45 to 47, long, high anteriorly; anal, III, 40 to 44, similar to dorsal; pelvic, absent in adult; pectoral long, reaching nearly to middle of dorsal fin, falcate; caudal, deeply furcate. Lateral line: slightly decurved anteriorly. Scales: cycloid, small. Colour: metallic blue on dorsal surface; bright silvery on sides and ventral surface; entirely iridescent; dusky on margin of lobes of dorsal and anal fins.

Length to 11 inches.

Distinguished by the greatly compressed deep scaly body, the long falcate pectoral fins and the absence of pelvic fins.

The California pompano was first taken in British Columbia waters in September, 1903, in Juan de Fuca strait and the specimen is now in the collection of the Provincial Museum. It was recorded in 1909 by F. Kermode as *Palometa simillima* Ayres. Other individuals have been obtained as follows: two in 1908 off Victoria; one, December 15, 1940, off the Chemainus river in an otter trawl; one, August 26, 1941, at Sooke in a salmon-trap. This is a fish of southern distribution and only an occasional stray reaches western Canadian waters. It has a ready sale on the fresh-fish market of California because of the richness and delicacy of its flesh.

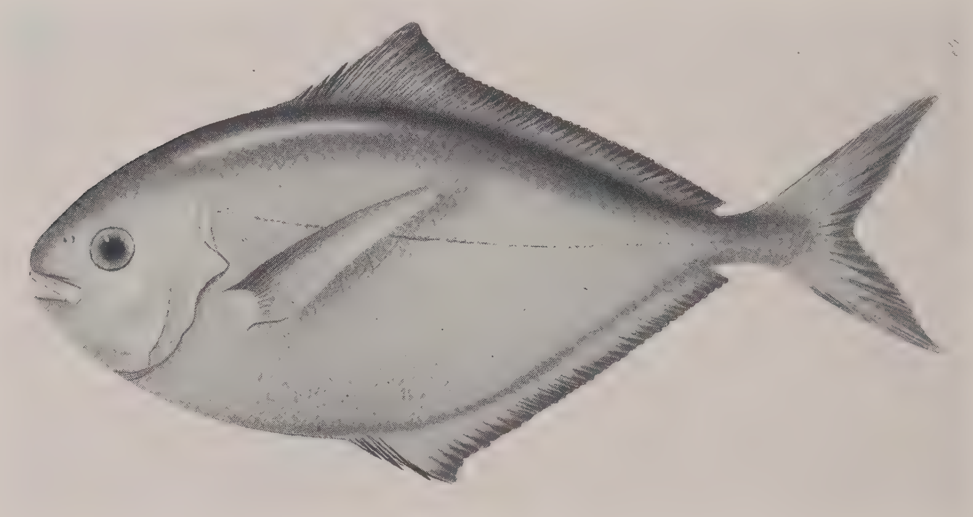

FIGURE 138. California pompano. *Peprilus simillimus* (Ayres) 1860

Range southern California to strait of Georgia.

Family CENTROLOPHIDAE Rudder-fishes

In the rudder-fishes the body is elongate, moderately deep, and compressed. The plications of the pharyngeal sac have weak needle-like teeth. The dorsal and anal fins are highest posteriorly, each preceded by 3 weak spines; the pelvic fins are thoracic, small, each composed of 1 weak spine and 5 rays; the caudal fin is rounded.

The rudder-fishes are pelagic, frequently extending into deep water.

Brown rudder-fish *Icichthys lockingtoni* Jordan and Gilbert 1880

Body elongate, slender, compressed, flexible; narrowly compressed at bases of dorsal and anal fins. Head small, dorsal surface spongy, with free margin posteriorly overlapping anterior of occipital region; mouth terminal, moderate, slightly oblique; maxillary extending to point below pupil; teeth: on jaws only, minute, slender, sharp, weak; on pharyngeal plications, needle-like, weak; operculum striate; gill membranes separate, free from isthmus. Fins: dorsal (1), III, 34 to 39, spines slender, fin low anteriorly, higher posteriorly, maximum height near posterior end; anal, III, 20 to 25, similar to dorsal; pelvic, I, 5, thoracic, spine slender, weak, fifth ray slender, filamentous; pectoral small, rounded, base fleshy; caudal, rounded, rudder-like. Lateral line: nearly straight, indistinct. Scales: cycloid, deciduous; covering body and head; on lateral line, 115 to 121, small. Colour: bluish gray to brown; darker on scale pockets; dusky to black on fins.

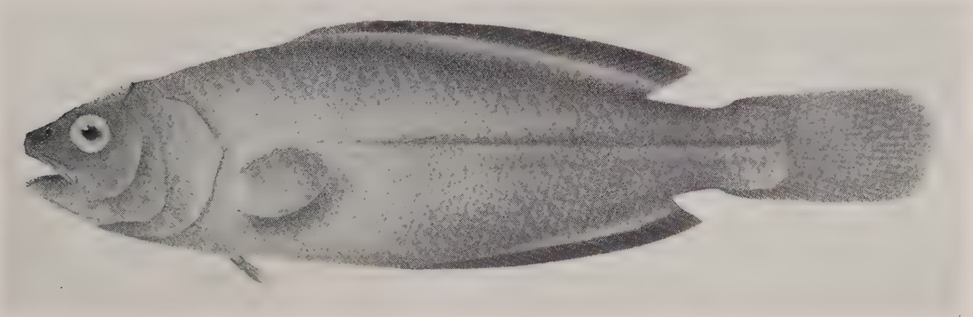

FIGURE 139. Brown rudder-fish. *Icichthys lockingtoni* Jordan and Gilbert 1880

Length to 8 inches.

Distinguished by the flexible slender compressed scaled body, the spongy crown with the free flap on the head, the pelvic fins each with 1 spine and 5 rays, the fifth ray slender, filamentous and the rudder-like caudal fin.

The brown rudder-fish is known in British Columbia waters from two specimens. The first, 8 inches in length, was taken August 5, 1935, from a fish-trap at Sooke by Mr. T. Spouse. It was recorded in 1938 by I. McT. Cowan and is now in the Provincial Museum at Victoria. The second, 4 inches in length, was obtained August 22, 1935, from Esperanza inlet by Mr. M. Brevik and is now in the collection of the Pacific Biological Station. The skeleton of this fish is very flexible because of the weak ossification, a characteristic of many deep-sea fishes such as the rag-fishes with which the brown rudder-fish has sometimes been grouped in classification. The young are found frequently near the surface and in California waters have been observed in association with jelly-fishes.

Range northern California to west coast of Vancouver island.

Suborder MUGILOIDEA

The fishes in this suborder have two dorsal fins, well separated, the first spinous, the second rayed, sometimes with 1 spine; the pelvic fins are thoracic and are situated well behind the pectoral fins, each with 1 spine and 5 rays; the pelvic bones sometimes are attached to the cleithra by a long ligament.

The suborder includes three families: the Sphyraenidae, barracudas; Mugilidae, mullets; and the Atherinidae, silversides, only the first of which appears in British Columbia waters.

Family SPHYRAENIDAE Barracudas

In the barracudas the body is elongate, slender, more or less terete. The head is very long, pointed, pike-like; the mouth is large; the lower jaw is projecting; the teeth are large, strong, sharp-edged, unequal in size on jaws and palatines. The first dorsal fin is depressible in a groove; the second dorsal fin is placed far back on the body over the anal fin.

The barracudas are large swift-swimming precadeous fish, reaching a length of 8 feet and a weight of about 100 pounds. They are voracious and occasionally attack bathers. For the most part the distribution of this family is subtropical and tropical.

Barracuda *Sphyraena argentea* Girard 1854

Body elongate, slender, subterete. Head very elongate, sharply pointed; mouth terminal, large; lower jaw strongly projecting; teeth well developed, large, sharp, fang-like, on jaws and palatines; snout acute; gill membranes separate, free from isthmus. Fins: dorsal (2), V—I, 9 or 10, widely separated; anal, I, 8 to 10, origin slightly behind that of rayed dorsal; pelvic, I, 5, thoracic, some distance behind pectorals; pectoral, low; caudal, furcate. Lateral line: high anteriorly, decurved gradually. Scales: cycloid, small; on lateral line, about 166; in row above lateral line, about 274. Colour: bluish brown on dorsal surface; silvery white on ventral surface.

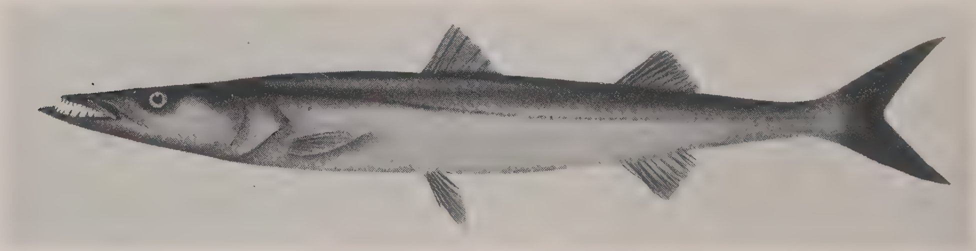

FIGURE 140. Barracuda. *Sphyraena argentea* Girard 1854

Length to 5 feet.

Distinguished by the slender subterete body, the sharply pointed head, the large fang-like teeth, the presence of two widely separated dorsal fins, the first spinous, the second with 1 spine and 9 or 10 rays and the pelvic fins thoracic in position but situated well behind the pectoral fins.

The barracuda was first taken in British Columbia waters July 27, 1904, at Otter point near Sooke in a fish-trap. Three specimens were obtained, presented to the Provincial Museum at Victoria and recorded in 1909 by F. Kermode. The barracuda is captured occasionally along the coast from Juan de Fuca strait to the Queen Charlotte islands and the vicinity of Prince Rupert. It is common off the coast of California where spawning takes place chiefly during June in the open ocean. A length of 32 inches may be reached at the end of the sixth year and sexual maturity may be attained in the second or third years at lengths of 16 to 25 inches. The food consists of various fishes. This is an important commercial species in California where its rich, firm, well-flavoured flesh is in much demand. It is also a sport fish, being taken with jigs, plugs and live bait.

Range southern California to northwestern Alaska.

Order SCLEROPAREI

In this order are included fishes which are related to those in the order Percomorphi. They differ, however, in having the third suborbital bone greatly enlarged and forming a rod or stay or plate extending downward and backward from below the eye, touching or nearly touching the preopercle. In some instances the stay is outwardly evident but usually its presence and form cannot be determined without dissection.

The order comprises many families, of which nine are represented in British Columbia waters.

Family SCORPAENIDAE Rock-fishes

In the rock-fishes the body is elongate and stout. The head is large and usually bears prominent ridges and spines in definite positions. The scales are large and ctenoid. The dorsal fin is single with 13 to 15 spines and 9 to 16 rays; the anal fin has 3 stout spines and 5 to 9 rays; the pelvic fins are thoracic, each with 1 spine and 5 rays.

The rock-fishes constitute a group of many species largely in the north temperate seas. Over fifty species are known along the eastern shores of the Pacific ocean from California to Alaska and at least twenty-one of these are found in British Columbia waters, in two genera, *Sebastodes* and *Sebastolobus*.

These fishes frequently are called rock-cods but since they have no close relationship with the true cods, Gadidae, it seems advisable to adopt the term rock-fishes and discard the term "cod" in reference to members of this family.

Many species inhabit rocky shores but the family has representatives in a vertical range from tide-water to 822 fathoms. Species living near the surface are for the most part brown in colour while those in deep water often have red predominating.

All of the members of the genus *Sebastodes* give birth to young. These are less than ½ inch in length and are produced in large numbers during the summer months.

The rock-fishes have firm white flesh which is very palatable and of excellent food value. The market demand for them has been increasing steadily. The bulk of the catch is filleted for the fresh-fish trade.

Bocaccio *Sebastodes paucispinis* (Ayres) 1854

Body rather elongate, slender, depth 3.6 to 3.75 in standard length. Head elongate, pointed; upper profile moderately sloping, straight from tip of upper jaw to origin of dorsal fin; mouth terminal, large; lower jaw greatly projecting, more so that in any other species of *Sebastodes*, extending beyond upper profile of head; symphyseal knob large; interorbital space convex, broad; cranial spines: parietal; supracleithral; cleithral; all minute; opercular, 2, upper larger; preopercular sharp, third distinctly largest; lacrymal lobes, 2, second minutely spinous. Fins: dorsal (1), XIII or XIV, 13 or 14, very deeply notched so that spinous and rayed portions almost separate, membranes of spinous portion slightly incised; anal, III, 7 to 9; pelvic, I, 5, thoracic, relatively short, not reaching anus; pectoral, 15, not reaching anus. Scales: weakly ctenoid, very small; in oblique rows above lateral line, 90 to 105. Pores: on lateral line, 56 to 70. Colour: light green to dark brown on dorsal surface; shading into dull reddish bronze to white on ventral surface; everywhere flushed with clear pale red, often with intense black spots on body; red on lower jaw, black on tip; white to silvery on peritoneum.

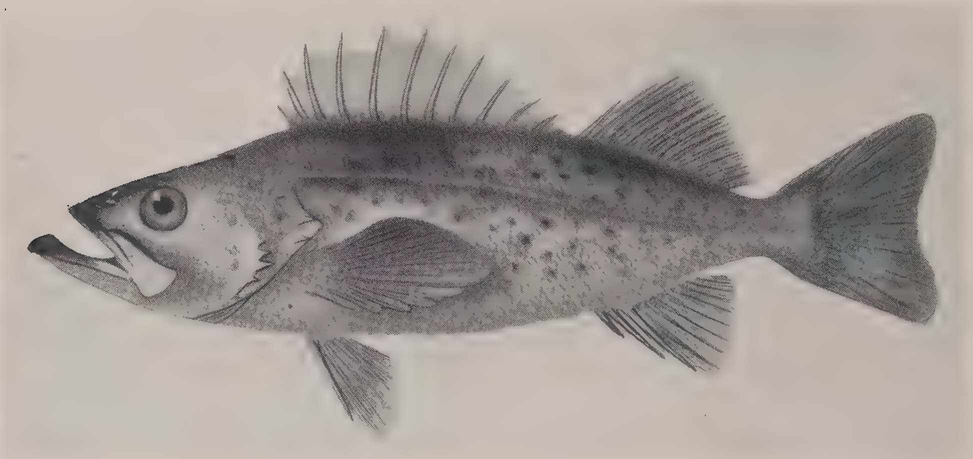

FIGURE 141. Bocaccio. *Sebastodes paucispinis* (Ayres) 1854

Length to 3 feet.

Distinguished by the convex interorbital space, the large mouth with the greatly projecting lower jaw, the 15 rays in each pectoral fin and the deeply notched dorsal fin.

The bocaccio was first recorded from British Columbia waters in 1866, without date or locality of capture, by J. K. Lord as *Sebastes paucispinis*. On September 27, 1888, a specimen 8 inches in length was secured by the *Albatross* in Barkley sound and recorded in 1907 by B. W. Evermann and E. L. Goldsborough. Subsequent records have been from Barkley and Howe sounds and in September, 1942, from Bates pass at Bull harbour. It is frequently included in commercial catches of rock-fishes from Juan de Fuca strait and the west coast of Vancouver island. The species usually occurs at depths below 40 fathoms. The food consists of small fishes. It is a relatively swift-moving rock-fish and in Howe sound has become a popular sport fish in deep trolling with light tackle using herring skin for a lure. In California it is an important commercial species. The word bocaccio means large mouth.

Range southern California to Queen Charlotte sound.

Yellow-tailed rock-fish *Sebastodes flavidus* Ayres 1862

Body elongate, moderately deep, depth 2.9 to 3.5 in standard length. Head with upper profile steep, slightly curved; mouth terminal, large; lower jaw strongly projecting, not extending beyond upper profile of head; symphyseal knob prominent; snout sharply pointed; eye moderate, diameter 3.4 to 4.5 in length of head; interorbital space highly convex, broad; cranial spines: nasal; supracleithral (sometimes absent); cleithral; all minute; opercular, 2, small; preopercular small, second and third largest; lacrymal lobes and spines, absent. Fins: dorsal (1), XIII, 14 or 15, moderately notched, membranes of spinous portion deeply incised;

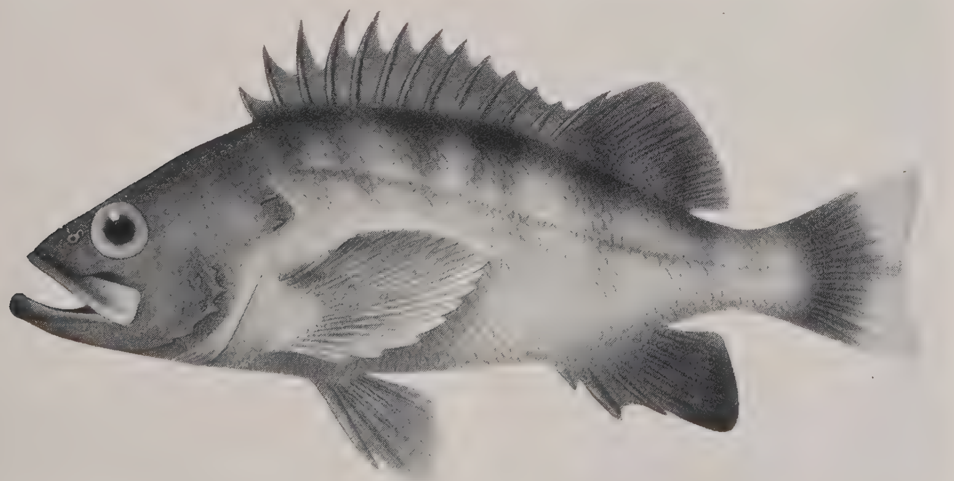

FIGURE 142. Yellow-tailed rock-fish. *Sebastodes flavidus* Ayres 1862

anal, III, 7 to 9; pelvic, I, 5, thoracic, not reaching anus; pectoral, 17 or 18, rarely 19, not reaching anus, lower 7 to 9 rays moderately thickened. Scales: weakly ctenoid; in oblique rows above lateral line, 60 to 70. Pores: on lateral line, 50 to 60. Colour: dark gray, vaguely streaked and mottled with black and washed with dusky green; dusky green with faint yellow on fins (pronounced after death); dusky yellow on tip of caudal fin; white on peritoneum.

Length to 2 feet 2 inches.

Distinguished by the highly convex interorbital space without spines, the deeply incised membranes of the spinous portion of the dorsal fin, the dark gray coloration on the body washed with dusky green, the dusky yellow on the tip of the caudal fin and the white peritoneum.

The yellow-tailed rock-fish was first taken in British Columbia waters March 18, 1934, when two large specimens were caught off Departure bay. Other individuals have been examined from Clayoquot sound near Flores island, taken May 23, 1934, from Baynes sound, February 12, 1942, at depths of 30 to 40 fathoms and three juveniles from Sooke traps, August 17, 1942. Additional specimens have been reported from various localities around Vancouver island taken in trawls, on trolls and on lingcod lines. In California waters the food consists of crustaceans and small fishes. The yellow-tailed rock-fish is considered an excellent food fish.

Range southern California to Vancouver island.

Black rock-fish *Sebastodes melanops* (Girard) 1856)

Body elongate, deep, depth 2.5 to 2.9 in standard length. Head with upper profile steep, almost straight; mouth terminal, large; lower jaw slightly projecting,

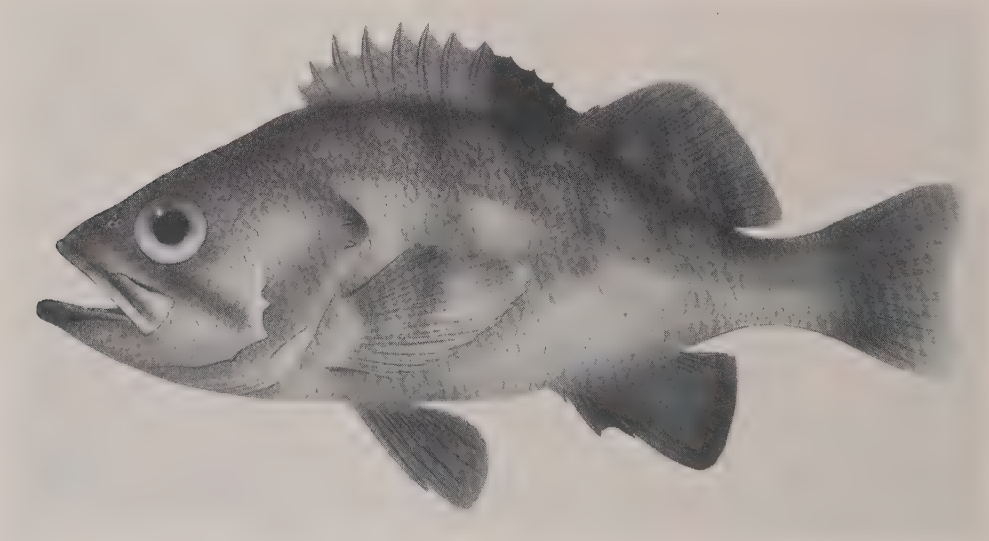

FIGURE 143. Black rock-fish. *Sebastodes melanops* (Girard) 1856

blunt, not extending beyond upper profile of head; symphyseal knob moderate; snout rather blunt; eye moderate, diameter 4.1 to 5.5 in length of head; interorbital space highly convex, broad; cranial spines: nasal; supracleithral (sometimes absent); cleithral; all minute; opercular, 2, small; preopercular small, second and third largest; lacrymal lobes and spines, absent. Fins: dorsal (1), XIII, 13 to 16, moderately notched, membranes of spinous portion moderately incised; anal, III, 7 to 9; pelvic, I, 5, thoracic, barely reaching anus; pectoral, 19, rarely 18 or 20, not reaching anus, lower 10 rays thick, leathery. Scales: ctenoid; in oblique rows above lateral line, 60 to 70. Pores: on lateral line, 51 to 53. Colour: olive brown to black on dorsal surface; paler on sides; soiled white on ventral surface; dusky black above on head, dark streak from eye across cheek, dark streak on maxillary; usually black spot on posterior of spinous portion of dorsal fin (conspicuous in young); black on all fins; sometimes carmine red on mandible and all fins except dorsal; white on peritoneum.

Length to 20 inches.

Distinguished by the highly convex interorbital space without spines, the moderately large eyes, the black coloration sometimes blotched with carmine red and the white peritoneum.

The black rock-fish was first recorded from British Columbia waters in 1866, without date or locality, by J. K. Lord, as *Sebastes melanops*. On September 23, 1888, it was taken in Barkley sound by the *Albatross* and recorded in 1907 by B. W. Evermann and E. L. Goldsborough. Two specimens obtained in 1895 in Juan de Fuca strait near Victoria were recorded in 1898 by J. Fannin as *Sebastichthys melanops*. Apparently the species is widely distributed along the coast of British Columbia. It is a common shore form amongst the rocks and is taken frequently on hand-lines. The black rock-fish and the priest-fish are confused by fishermen who call them "black bass" indiscriminately.

Range northern California to northwestern Alaska.

Priest-fish *Sebastodes mystinus* (Jordan and Gilbert) 1880

Body elongate, deep, depth 2.7 to 2.9 in standard length; dorsal and ventral profiles evenly curved. Head relatively short, bluntly pointed; mouth terminal, large, lower jaw slightly projecting, not extending beyond upper profile of head; symphyseal knob, evident; eye small, diameter 4.5 to 5 in length of head; interorbital space highly convex, broad; cranial spines: nasal; prefrontal; supracleithral; cleithral; short, delicate; opercular, 2, moderate; preopercular, rather strong; lacrymal lobes and spines, absent. Fins: dorsal (1), XIII, 15, moderately notched, membranes of spinous portion slightly incised, very low, spines much shorter than longest rays; anal, III, 9 or 10; pelvic, 1, 5, thoracic, not reaching anus; pectoral, 17 or more, short, not reaching anus. Scales: ctenoid; in oblique rows above lateral line, 62 to 66. Pores: on lateral line, 50 to 55. Colour: grayish black on dorsal surface; paler below; often vaguely dappled or blotched with darker and lighter shades on back and sides; black streaks radiating downward and backward from eye, 2; dusky to black on all fins; black on peritoneum.

Length to 20 inches.

Distinguished by the highly convex interorbital space without spines, the small prefrontal spines, the low spinous portion of the dorsal fin, the small eyes and the grayish black coloration on the body and on the peritoneum.

The priest-fish was first taken in British Columbia waters in 1885 from Queen Charlotte strait by Dr. G. M. Dawson at a depth of 10 fathoms and recorded in 1887 by J. F. Whiteaves as *Sebastodes mystinus* Jordan and Gilbert. There was no further report of occurrence until the summer of 1940, when two specimens were captured in the strait of Georgia in an ottertrawl and were on display in the Vancouver Aquarium. This is not a shallow-water species and hence is not taken as frequently as the black rock-fish.

Range southern California to northwestern Alaska.

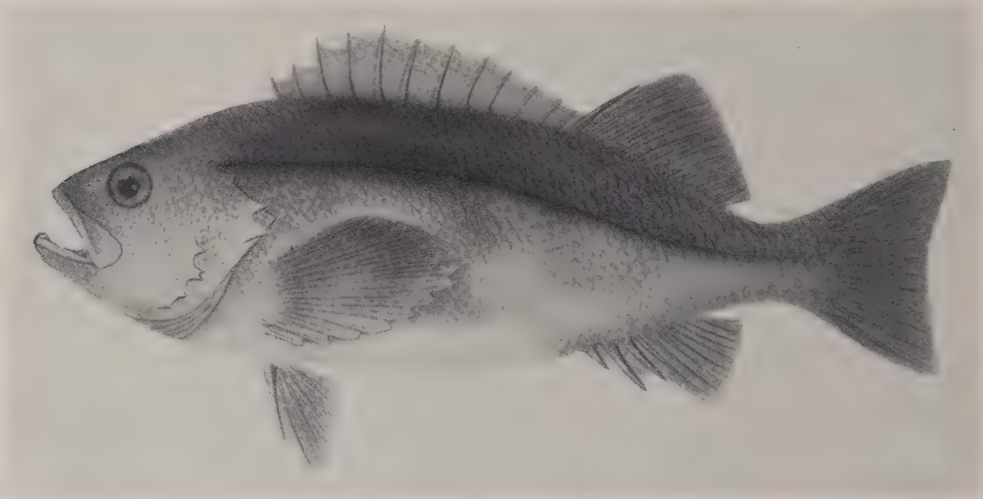

FIGURE 144. Priest-fish. *Sebastodes mystinus* (Jordan and Gilbert) 1880

Orange rock-fish *Sebastodes pinniger* (Gill) 1864

Body elongate, moderately deep, depth 2.5 to 3 in standard length. Head with upper profile somewhat curved; mouth terminal, large; lower jaw projecting, not extending beyond upper profile of head; symphyseal knob moderate; interorbital space convex, broad; cranial spines: nasal; prefrontal; frontals, II, III, minute; parietal, small; supracleithral, large; cleithral, large; opercular, 2, large; preopercular, slender, sharp; lacrymal lobes, 2, sharp spine on each, anterior small, sometimes absent; rakers on first gill arch, 12 to 15 + 26 to 28, long, rough. Fins: dorsal (1), XIII, 14, slightly notched, membranes of spinous portion moderately incised; anal, III, 7; pelvic, I, 5, thoracic, long, barely reaching anus; pectoral, barely reaching anus. Scales: ctenoid on body; cycloid on head and mandible; in oblique rows above lateral line, 45 to 51. Pores: on lateral line, 40 to 47. Colour: light olive gray with clear orange red or light orange yellow, red predominating, on dorsal surface; paler, nearly white on ventral surface; reddish orange streak along upper portion of body below dorsal fin; pale grayish streak immediately above posterior two-thirds of lateral line; orange blotch above pectoral fin; orange saddle over caudal peduncle; golden blotches on side of caudal peduncle, 2; yellow orange stripes radiating from eye, 3, bright; bright orange on all fin membranes; usually black blotch on membranes of spinous portion of dorsal fin between seventh and tenth spines, large, very distinct in young; pale red, with dusky mottling, on lining of mouth; black on peritoneum, pale gray to black in young.

Length to 2 feet 6 inches.

Distinguished by the orange coloration, the three bright orange stripes across the head, the pale red with the dusky mottling on the lining of the mouth, the spines on the lacrymal lobes and the smooth scaly mandible.

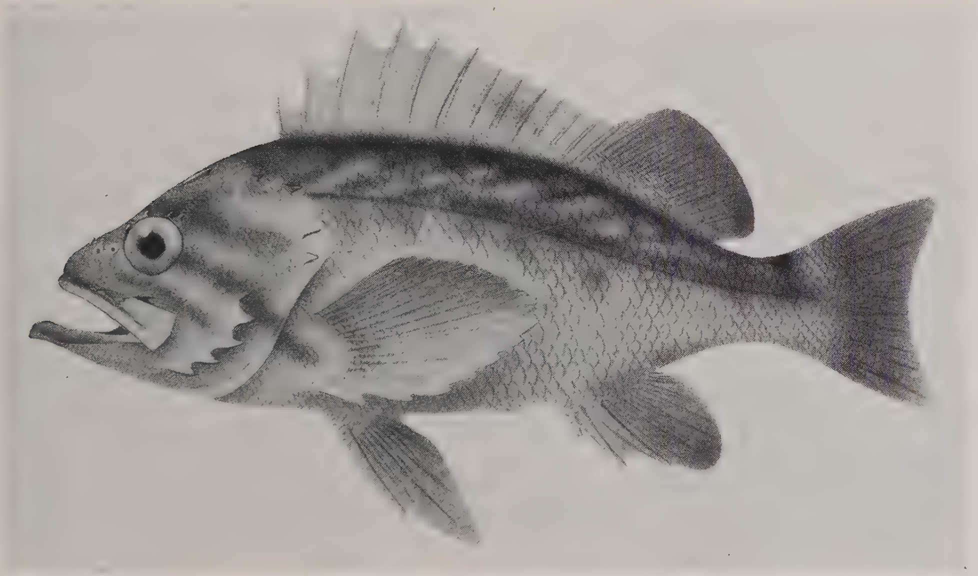

FIGURE 145. Orange rock-fish. *Sebastodes pinniger* (Gill) 1864

The orange-rock-fish was first recorded from British Columbia waters in 1891 from the vicinity of Victoria by Ashdown Green as *Sebastichthys pinniger*. On June 20, 1903, a specimen 4½ inches in length was obtained in the strait of Georgia off Bowen island by the *Albatross*, station 4193, lat. 49° 20′ N., long. 123° 43′ W., depth 23 fathoms. The species is rather common along the coast. The young inhabit shore waters while the older fish are distributed in the deeper waters, very large individuals occurring at depths of at least 100 fathoms. Females with embryos somewhat less than ⅜ of an inch in length have been observed in February and early March. Large individuals may contain as many as 600,000 young. Commercial catches are made in trawls and on jigs baited with live herring. The fish is very palatable and finds a ready market.

Range southern California to Dixon entrance.

Vermilion rock-fish *Sebastodes miniatus* (Jordan and Gilbert) 1880

Body elongate, moderately deep, depth about 3 in standard length. Head with upper profile somewhat curved; mouth terminal, large; lower jaw slightly projecting, not extending beyond upper profile of head; dentary elevation fitting into notch in upper jaw; symphyseal knob moderate; interorbital space slightly convex, width medium; cranial ridges: low, broad, weak; cranial spines: nasal; prefrontal; frontals, I, II, III; parietal; delicate; supracleithral large; cleithral large; opercular, 2, large; preopercular moderately long, sharp, radiating, lacrymal lobes and spines, absent; rakers on first gill arch 9 or 10 + 26, long, slender. Fins: dorsal (1), XIII, 14, deeply notched, membranes of spinous portion deeply incised; anal, III, 7; pelvic, I, 5, thoracic, long, reaching behind anus almost to anal fin; pectoral, not reaching anus. Scales: ctenoid on body, head and mandible; in oblique rows above lateral line, 45 to 53. Pores: on lateral line 43 to 51. Colour: deep vermilion on dorsal surface; pinkish mottling on sides; light red on ventral surface; black dots in clusters everywhere on back and sides giving dusky shade to body; red on lips, mottled with darker; red streak on maxillary; orange

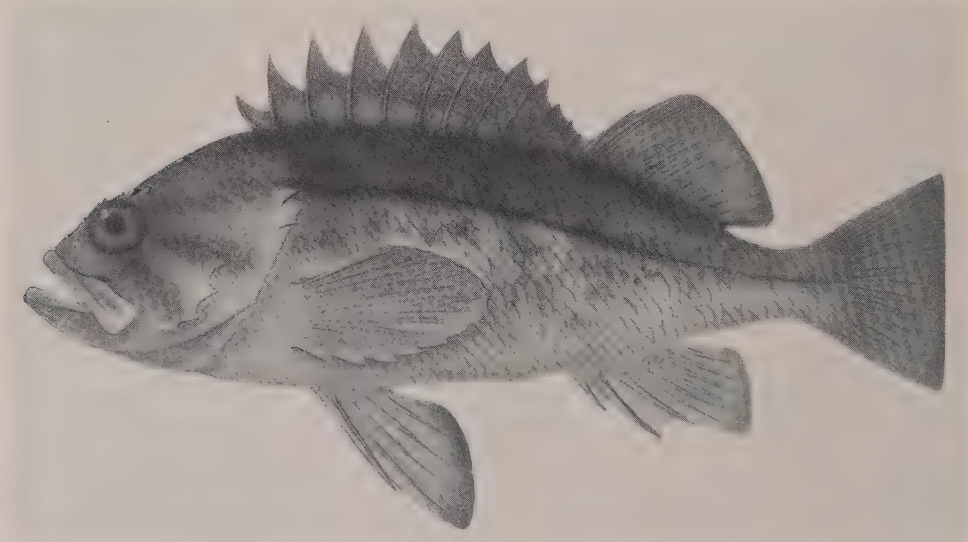

FIGURE 146. Vermilion rock-fish. *Sebastodes miniatus* (Jordan and Gilbert) 1880

stripes radiating from eye, 3, obscure; cross blotches on top of head, faint; bright vermilion scattered on all fins; black on margins, black dots on membranes; olive gray spots on base of spinous portion of dorsal fin, somewhat black on posterior margin; dark olive streak on each membrane, vertical; red on lining of mouth; white to dusky on peritoneum.

Length to 3 feet.

Distinguished by the vermilion coloration, the three obscure orange stripes radiating from each eye, the red mouth and the rough scaly mandible.

The vermilion rock-fish was first taken in British Columbia waters May 14, 1934, in Clayoquot sound near Flores island at a depth of about 30 fathoms in a trawl, by Mr. E. G. Hart, and is now in the collection of the Pacific Biological Station. A second specimen, three feet in length, was obtained in the summer of 1934 in the strait of Georgia and was observed at the Deep bay reduction plant.

Range southern California to Vancouver island.

Wilson's rock-fish *Sebastodes wilsoni* Gilbert 1915

Body elongate, depth 3.1 to 3.7 in standard length. Head with upper profile straight; mouth terminal, moderate; lower jaw projecting, not extending beyond upper profile of head; symphyseal knob small; interorbital space flat, width mendium; cranial ridges: well developed; cranial spines: nasal; prefrontal; frontal, II, III; parietal; strong; supracleithral, 2; cleithral; opercular, 2; preopercular, strongly developed; lacrymal lobes, 2, spines absent; rakers on first gill arch, 12 or 13 + 29 to 31, long, slender. Fins: dorsal (1), XIII, 14, very slightly notched, membranes of spinous portion moderately incised; anal, III, 6 or 7, short; pelvic,

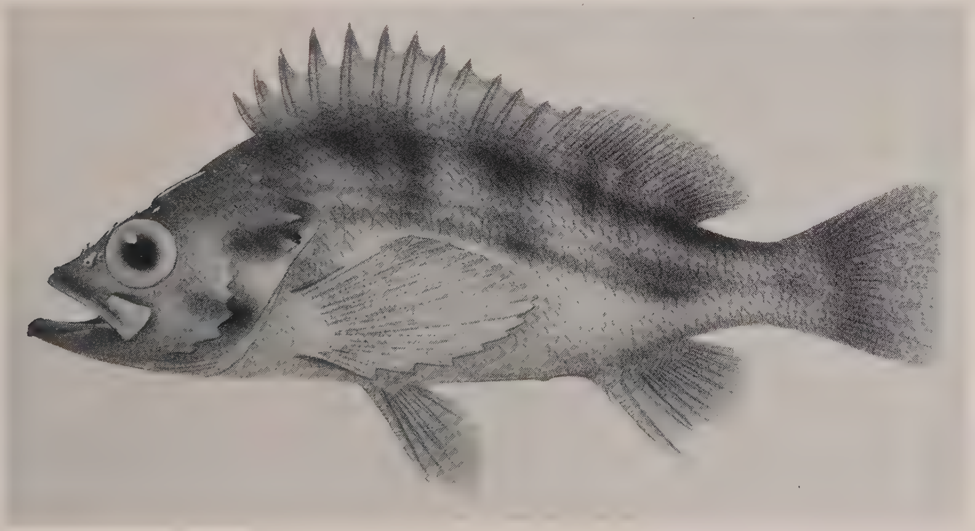

FIGURE 147. Wilson's rock-fish. *Sebastodes wilsoni* Gilbert 1915

I, 5, thoracic, just reaching anus; pectoral, just reaching anus. Scales: ctenoid; in oblique rows above lateral line, 45 to 48. Pores: on lateral line, 41 to 44. Colour: very light brown, flushed with clear red; dark blotches in series along base of dorsal fin, 4, extending somewhat onto fin; brownish red stripe along side below lateral line; silvery on ventral surface; black on peritoneum.

Length to 7¼ inches.

Distinguished by the coloration, the 45 to 48 scales in oblique rows above the lateral line, the 2 supracleithral spines, the elongate body and the short anal fin with 6 or 7 rays.

Wilson's rock-fish was first taken in British Columbia waters September 10, 1912, off Swiftsure shoal at a depth of 23 fathoms by Professor J. P. McMurrich and was recorded in 1932 by C. L. Hubbs and L. P. Schultz. The specimen is now in the collection of the Pacific Biological Station. Three other individuals have been obtained between Esteban point and Sydney inlet at depths of 61 and 30 fathoms. Apparently it is an off-shore species since all Canadian records are from the west coast of Vancouver island.

Range northern California to west coast of Vancouver island.

Red-striped rock-fish *Sebastodes proriger* (Jordan and Gilbert) 1880

Body elongate, slender; depth 3.2 to 3.6 in standard length. Head with upper profile almost straight; mouth terminal, moderate; lower jaw projecting, not extending beyond upper profile of head; symphyseal knob prominent; interorbital space slightly convex, width medium; cranial ridges: low, weak; cranial spines: nasal; prefrontal; frontals, II, III; parietal; supracleithral; cleithral; opercular, 2; well developed, delicate; preopercular sharp, second longest; lacrymal lobes, 2, spines absent; rakers on first gill arch, about 15 + 28, long, slender. Fins:

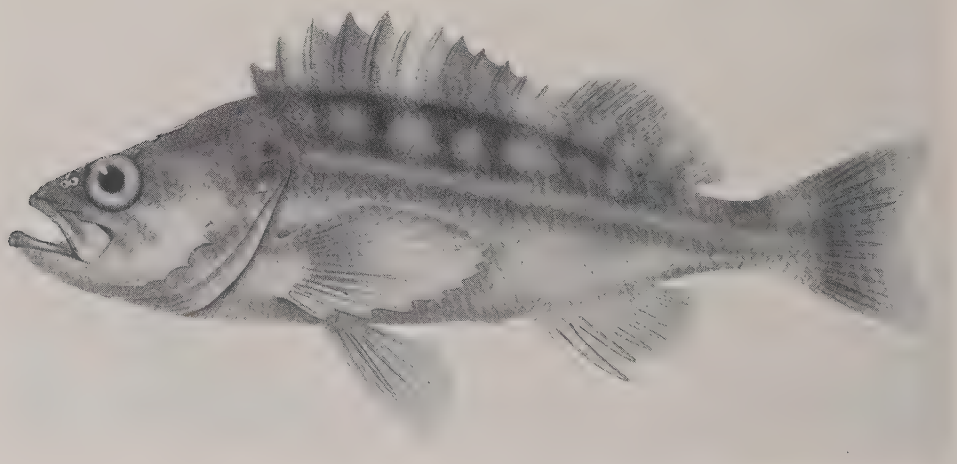

FIGURE 148. Red-striped rock-fish. *Sebastodes proriger* (Jordan and Gilbert) 1880

dorsal (1), XIII, 13 to 15, slightly notched, membranes of spinous portion moderately incised, longest spine about equal to longest ray; anal, III, 7 or 8, second spine longer and stronger than third; pelvic, I, 5, thoracic, barely reaching anus; pectoral, reaching anus. Scales: ctenoid; in oblique rows above lateral line, 65 to 75. Pores: on lateral line, 47 to 51. Colour: bright light red, mottled on dorsal surface with dusky olive green; light red stripe along lateral line, continuous, distinct; olive stripes radiating from eye, 2, wide; purplish cross shades on head; dusky to black on lips and tip of lower jaw; bright light red on fins; black on spinous portion of dorsal fin, olive on rayed portion; olive speckling on caudal fin; black on peritoneum.

Length to 2 feet.

Distinguished by the shallow notch in the dorsal fin, the 65 to 75 scales in oblique rows above the lateral line, the red stripe along the lateral line and the black peritoneum.

The red-striped rock-fish was first taken in British Columbia waters August 6, 1881, near Campbell island (Port McLaughlin), by Capt. H. E. Nichols in 14 fathoms and recorded in the same year by T. H. Bean in error as *Sebastodes paucispinis* (Ayres). A second specimen was obtained June 19, 1928, from Departure bay and is now in the collection of the Royal Ontario Museum of Zoology at Toronto. The species is taken more commonly to the southward.

Range southern California to southeastern Alaska.

Long-jawed rock-fish *Sebastodes alutus* (Gilbert) 1890

Body elongate; depth 3 to 3.5 in standard length. Head with upper profile nearly straight; mouth terminal, large; lower jaw greatly projecting, not extending

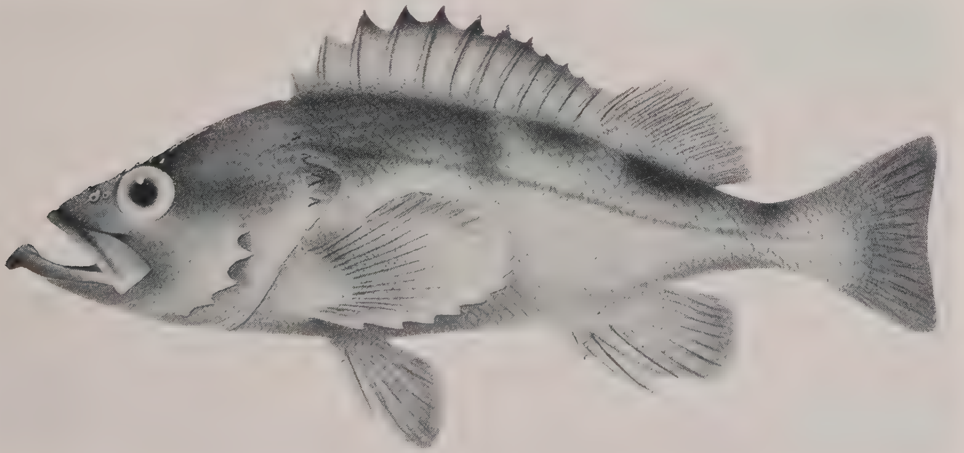

FIGURE 149. Long-jawed rock-fish. *Sebastodes alutus* (Gilbert) 1890

beyond upper profile of head; symphyseal knob, very prominent; dentary elevation fitting into notch in upper jaw; interorbital space slightly convex to flat, width medium; cranial ridges: moderately developed; cranial spines: nasal; prefrontal; frontals, I, II, III; parietal; slender, delicate; supracleithral; cleithral; opercular, 2; preopercular, broad, flat; lacrymal lobes weakly developed, spine sometimes present; rakers on first gill arch, 11 or 12+25 or 26, long, clavate. Fins: dorsal (1), XIII, 15, moderately notched, membranes of spinous portion slightly incised; anal, III, 8; pelvic, I, 5, thoracic, reaching anus; pectoral, reaching slightly behind anus. Scales: ctenoid, large; in oblique rows above lateral line, 60 to 75. Pores: on lateral line, 47 to 52. Colour: bright carmine red; lighter on ventral surface with some silvery; olive brown blotches at base of spinous portion of dorsal fin, 2, below rayed portion of fin, 1; dark blotch on upper surface of caudal peduncle, small; blotches or bars on side of head, irregular; black on lower lip and tip of mandible; red on all fins, black on margin of spinous portion of dorsal fin; dusky on lining of mouth; dusky to black on peritoneum.

Length to 15 inches.

Distinguished by the slightly convex to flat interorbital space, the long lower jaw not extending beyond the upper profile of the head, the very large symphyseal knob and the carmine red coloration with black markings.

The long-jawed rock-fish was first taken in British Columbia waters August 28, 1891, in Juan de Fuca strait off Port San Juan, by the *Albatross*, station 3449, lat. 48° 29′ N., long. 124° 40′ W., depth 136 fathoms. Two other individuals were obtained the following month in the same region and all were recorded in 1895 by C. H. Gilbert. On June 5, 1934, four specimens were captured off the west coast of Vancouver island near Esteban point at 61 fathoms. The species is reported to be abundant in northern waters at depths between 38 and 350 fathoms. It is found frequently to be a part of the food of the halibut.

Range southern California to northwestern Alaska.

Olive-backed rock-fish *Sebastodes saxicola* (Gilbert) 1890

Body elongate; depth 3 to 3.25 in standard length. Head with upper profile somewhat curved; mouth terminal, moderate; lower jaw slightly projecting, not extending beyond upper profile of head; symphyseal knob, small; premaxillaries not produced into prominent dentigerous lobes; interorbital space flat, width medium; cranial ridges: moderately developed; cranial spines: nasal; prefrontal; frontals, I, II, III; parietal; moderately developed; supracleithral, large; cleithral; opercular, 2; preopercular, pointed, sharp; lacrymal lobes usually bluntly triangular, sometimes minute spine on each lobe, directed backward; rakers on first gill arch, 9 to 11 + 21 to 23, long, slender. Fins: dorsal (1), XIII, 12 or 13, slightly notched, membranes of spinous portion moderately incised; anal, III, 7 or 8, second spine longer and stronger than third; pelvic, I, 5, thoracic, usually not reaching anus; pectoral, moderate, reaching almost to anus. Scales: ctenoid, large; in oblique rows above lateral line, about 50. Pores on lateral line: 35 to 39.

Colour: olive brown on dorsal surface; silvery on ventral surface, overlaid with light red; usually black on tips of all fins, sometimes faint on pectorals; olive brown bands on caudal fin, conspicuous; white on lining of mouth; black on peritoneum.

Length to 13½ inches.

Distinguished by the absence of prominent dentigerous lobes from the upper jaw, the white lining of the mouth and gill cavity, the black peritoneum and the olivaceous coloration of the body.

The olive-backed rock-fish was first taken in British Columbia waters in 1888 in Barkley sound by the *Albatross* and recorded in 1907 by B. W. Evermann and E. L. Goldsborough. Another specimen was obtained in July, 1934, 16 miles off Nootka sound in 74 fathoms by Mr. E. G. Hart, and a third individual was secured in 1939 near Porlier pass in an otter trawl. It occurs at depths ranging from 25 to 391 fathoms in waters outside the Province.

Range southern California to southeastern Alaska.

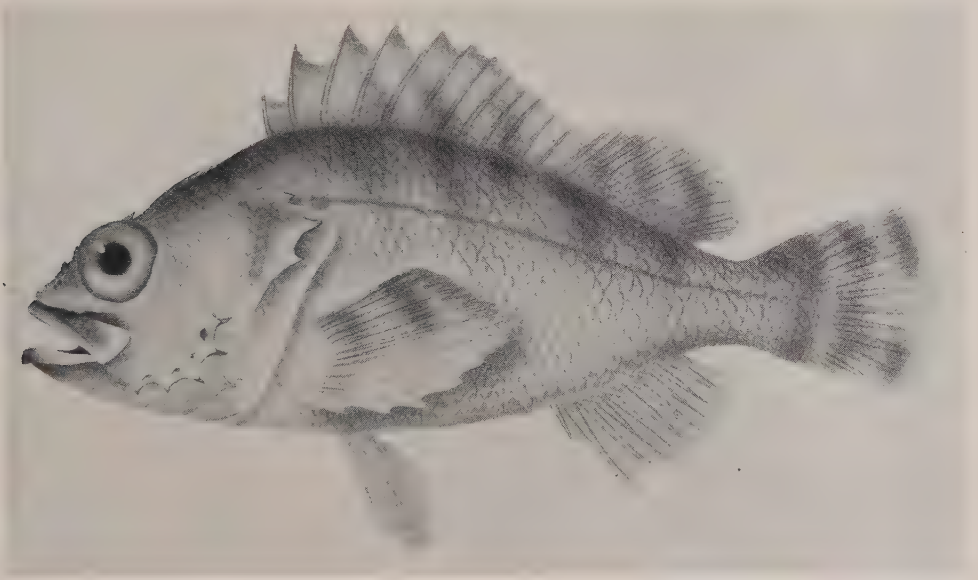

FIGURE 150. Olive-backed rock-fish. *Sebastodes saxicola* (Gilbert) 1890

Lobe-jawed rock-fish *Sebastodes diploproa* (Gilbert) 1890

Body elongate; depth 2.75 to 3.1 in standard length. Head with upper profile straight; mouth terminal, moderate; jaws about equal; symphyseal knob, very small; premaxillaries, greatly produced on each side of median line of snout forming 2 prominent forwardly projecting dentigerous lobes, widely separated; dentigerous areas on lower jaw forming single median lobe at symphysis, fitting into notch of upper jaw; interorbital space flat, width medium; cranial ridges: moderately developed; cranial spines: nasal; prefrontal; frontals, II, III; parietal; thin, sharp, moderately developed; supracleithral, small; cleithral, large; opercular, 2, large; preopercular, pointed, sharp, almost evenly spaced, second and third longest; lacrymal lobes, 2, large spine on each, pointing downward; rakers on first gill arch, 9 to 11 + 23 to 25, long, slender. Fins: dorsal (1), XIII, 11 to 13, moderately notched, membranes of spinous portion moderately incised; anal, III, 7 or 8, second spine longer and stronger than third; pelvic, I, 5, thoracic, barely reaching anus; pectoral, long, reaching slightly behind origin of anal fin. Scales: ctenoid, large, deciduous; in oblique rows above lateral line, about 48. Pores: on lateral line, 33 to 37. Colour: uniform rose red to brick red on dorsal surface; bright silvery on sides and ventral surface; sometimes sparsely spotted with black; dusky bar faint behind pectoral fin; rose red on lining of mouth and gill cavity; jet black on peritoneum.

Length to 12½ inches.

Distinguished by the large projecting toothed lobes on the upper jaw into which fit the united dentigerous lobes of the lower jaw, the two prominent sharp lacrymal spines pointing downward, the rose red lining of the mouth and gill cavity, the jet black peritoneum and the rose red and silver coloration of the body.

The lobe-jawed rock-fish was first taken in British Columbia waters June 19, 1903, near Nanaimo by the *Albatross*, station 4191, lat. 49° 11′ N., long. 123° 54′ W., depth 54 fathoms, when two specimens 3¼ inches and 3½ inches in length respectively, were obtained and were recorded in 1907 by B. W. Evermann

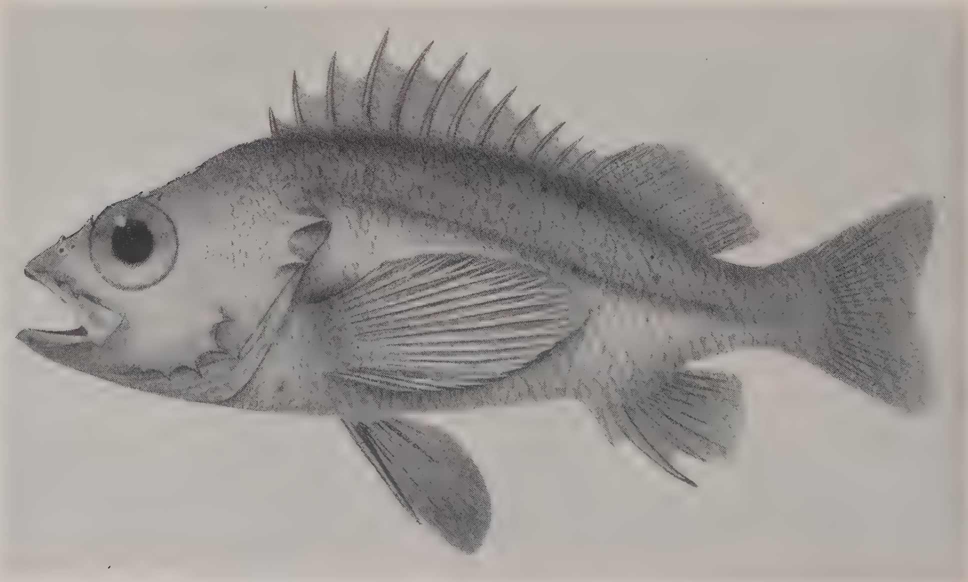

FIGURE 151. Lobe-jawed rock-fish. *Sebastodes diploproa* (Gilbert) 1890

and E. L. Goldsborough. Others have been secured in shrimp trawls off English bay at depths between 50 and 70 fathoms. In 1934, an individual was obtained from the west coast of Vancouver island south of Flores island. This rock-fish inhabits deep water for the most part having been taken at depths from 50 to 369 fathoms.

Range southern California to Vancouver island.

Black-throated rock-fish *Sebastodes introniger* (Gilbert) 1890

Body elongate; depth 2.7 to 2.9 in standard length. Head with upper profile almost straight; mouth terminal, moderate; lower jaw slightly projecting, not extending beyond upper profile of head; symphyseal knob, small; premaxillaries somewhat produced into widely separated toothed lobes; dentigerous areas on lower jaw forming 2 lobes slightly separated at symphysis; interorbital space flat to barely convex, width medium; cranial ridges: moderately developed; cranial spines: nasal; prefrontal; frontals, I, II, III; parietal, 2; sharp, moderately developed; supracleithral, 2; cleithral broad, sometimes bifid; opercular, 2; preopercular pointed, upper 2 closely approximated; lacrymal lobes large, large spine on anterior lobe, 3 to 5 on posterior lobe; rakers on first gill arch, 8 or 9 + 20 to 23, long, somewhat clavate. Fins: dorsal (1), XIII, 13 or 14, moderately notched, membranes of spinous portion moderately incised; anal, III, 7 or 8, second spine longer and much stronger than third; pelvic, I, 5, thoracic, reaching about half distance to anus; pectoral short, usually not reaching to anus. Scales: ctenoid, large, deciduous; in oblique rows above lateral line, 50 to 55. Pores: on lateral line, 31 to 36. Colour: bright clear orange red on dorsal surface, somewhat blotched with darker red; silvery on ventral surface overlaid with light red;

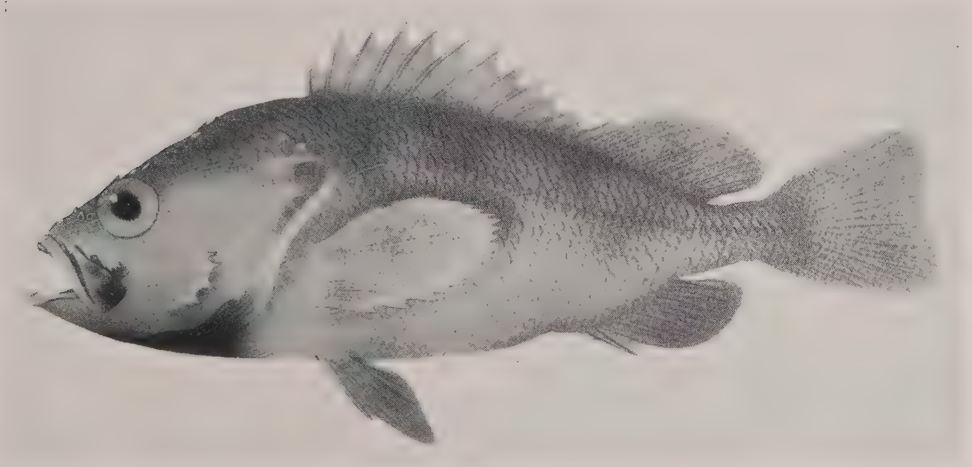

FIGURE 152. Black-throated rock-fish. *Sebastodes introniger* (Gilbert) 1890

black blotches on maxillary, isthmus, branchiostegal membranes and in axil of pectoral fin; dusky areas on all fins, darkest on pelvics and anal; black and red on lining of mouth and gill cavity; gray, speckled with black on peritoneum.

Length to 2 feet.

Distinguished by the separated dentigerous lobes on the upper and lower jaws, the 3 or 5 spines on the posterior lobe of the lacrymal bone, the red and black lining of the mouth and gill cavity; the gray coloration of the peritoneum speckled with black and the bright orange red coloration on the body.

The black-throated rock-fish was first taken in British Columbia waters February 23, 1943, at Seymour narrows. This is the only specimen authoritatively identified although fish dealers state that the species has long been recognized as distinguishable from the red snapper, which it superficially resembles. This individual was 23½ inches in total length and weighed 7 pounds, a female with large ovaries containing eggs about 1/25 of an inch in diameter.

Range southern California to northwestern Alaska.

Red snapper *Sebastodes ruberrimus* Cramer 1895

Body elongate, deep; depth 2.5 to 2.8 in standard length. Head with upper profile slightly curved; mouth terminal, large; lower jaw slightly projecting, not extending beyond upper profile of head; symphyseal knob, small; interorbital space, concave to flat, narrow; cranial ridges: well developed, sharp, in adult broken up into irregular spines and tubercles; cranial spines: nasal; prefrontal;

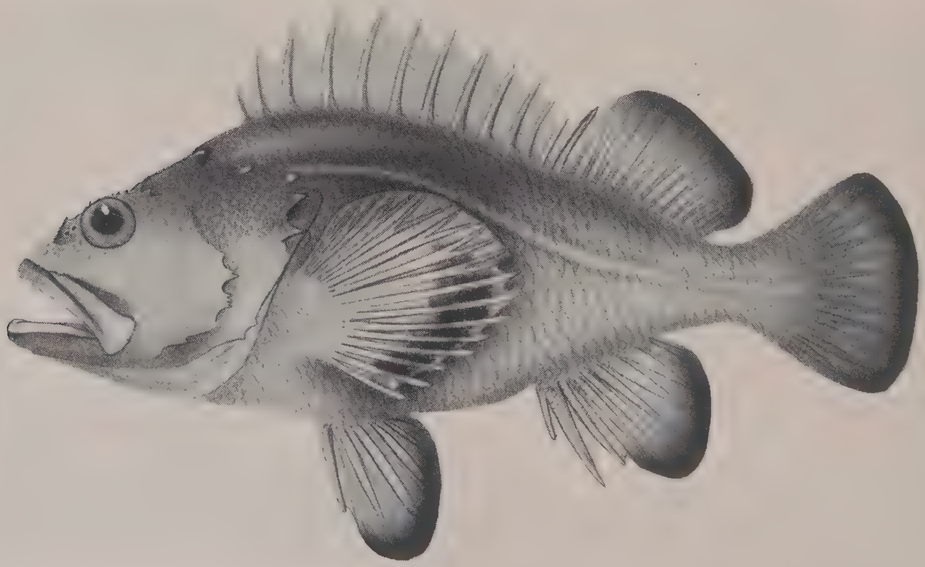

FIGURE 153. Red snapper. *Sebastodes ruberrimus* Cramer 1895

frontals, I, II, III; parietal; well developed, blunt; supracleithral; cleithral; opercular, 2; preopercular broad, third multifid, others sometimes bifid; lacrymal lobes little developed, spines absent; rakers on first gill arch, 8 or 9 + 18 to 20, short, rough, clavate. Fins: dorsal (1), XIII, 14 or 15, moderately notched, membranes of spinous portion moderately incised; anal, III, 7, second spine slightly longer and stronger than third; pelvic, I, 5, thoracic, not reaching anus; pectoral, broad, not reaching anus. Scales: ctenoid, on body and head; in oblique rows above lateral line, 50 to 52. Pores: on lateral line, 44 or 45. Colour: deep vermilion red; paler on ventral surface; whitish streak along lateral line, becoming rather indistinct in adults; in very large specimens from deep water, body and head frequently much dotted and blotched with black; red on fins, usually black on margins of rayed fins; white on peritoneum.

Length to 3 feet.

Distinguished by the multifid points on the third preopercular spine, the broken up spiny cranial ridges and the red coloration.

The red snapper was first recorded from British Columbia waters in 1881 by D. S. Jordan and C. H. Gilbert who reported seeing large specimens at Victoria and recorded then as *Sebastichthys ruber* (Ayres). These were undoubtedly *S. ruberrimus*, described in 1895 by F. Cramer. The species is common along the coast occurring at depths between 30 and 150 fathoms and is captured in trawls and on halibut, lingcod and dog-fish lines. In February, 1942, several large catches of red snappers were seen at the Vancouver fish docks, the fish having been caught in Pender harbour on dog-fish lines at depths between 100 and 150 fathoms. These were mostly of large size up to 3 feet in length. Little is known of the life history but Dr. J. L. Hart states that a female weighing 19½ lbs. contained approximately 2,700,000 eggs. This fish is of high quality and is sold in the round and as fillets.

Range southern California to northwestern Alaska.

Green-striped rock-fish *Sebastodes elongatus* (Ayres) 1859

Body very elongate, slender; depth about 3.3 in standard length. Head with upper profile straight; mouth terminal, moderate; lower jaw distinctly projecting, not extending beyond upper profile of head; symphyseal knob, very small; eye about 4 in length of head; interorbital space concave, narrow; cranial ridges: moderately developed; cranial spines: nasal; prefrontal; frontals, II, III; parietal; small, slender, sharp; supracleithral, 2, small; cleithral; opercular, 2; preopercular narrow, very sharp; lacrymal lobes little developed, spines absent; rakers on first gill arch, 9 or 10 + 20 to 22, long, strong. Fins: dorsal (1), XIII, 12 to 14, deeply notched, membranes of spinous portion moderately incised; anal, III, 6 or 7, second spine much longer than third; pelvic, I, 5, thoracic, not reaching anus; pectoral, reaching anus, lower rays not thickened. Scales: ctenoid, on body and head; in oblique rows above lateral line, 55 to 58. Pores: on lateral line, 43 to 45. Colour: green on dorsal surface; white on ventral surface; everywhere suffused with clear pale red; olive green stripes irregular, interrupted, strongly developed on sides; two below lateral line becoming confluent posteriorly; pale pink stripe along lateral line; olive on head, blotched dorsally, pale red ventrally; black on tip of chin; olive on dorsal, pectoral and caudal fins; pale red on pelvic and anal fins; dusky on peritoneum.

Length to 12 inches.

Distinguished by the slender body, the medium sized eye and the irregular olive green stripes along the sides of the body.

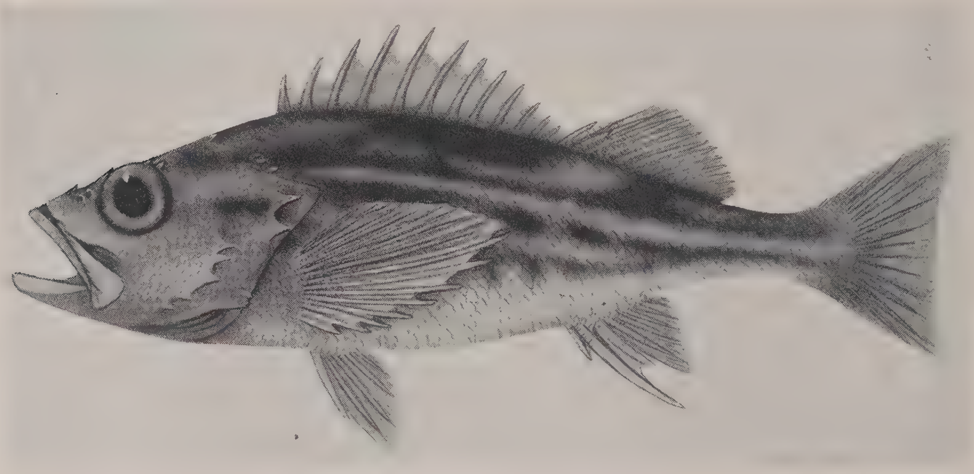

FIGURE 154. Green-striped rock-fish. *Sebastodes elongatus* (Ayres) 1859

The green-striped rock-fish was first taken in British Columbia waters July 18, 1928, in Boat harbour by Professor J. R. Dymond and the specimen is now in the collection of the Royal Ontario Museum of Zoology at Toronto. The species is fairly common in the strait of Georgia, Burrard inlet, Pender harbour and Baynes sound, inhabiting the deeper waters. In California there are records of its capture at depths down to 496 fathoms. This rock-fish is often obtained in commercial trawls but is seldom marketed.

Range southern California to strait of Georgia.

Big-eyed rock-fish *Sebastodes zacentrus* (Gilbert) 1890

Body very elongate, slender; depth 3.1 to 3.4 in standard length. Head with upper profile straight; mouth terminal, moderate; lower jaw projecting, not extending beyond upper profile of head; symphyseal knob, small; eye large, diameter about 3 in length of head; interorbital space concave, width medium; cranial ridges: moderately developed; cranial spines: nasal; prefrontal; frontals, II, III; parietal; strong; supracleithral; cleithral; opercular, 2; preopercular, slender, sharp; lacrymal lobes, 2, sometimes minute spine on posterior lobe;

rakers on first gill arch, 9 to 11 + 24 to 26, long, very slender. Fins: dorsal (1), XIII, 14 or 15, slightly notched, membranes of spinous portion moderately incised; anal, III, 7 or 8, second spine stout, usually longer than third; pelvic, I, 5, thoracic, reaching anus; pectoral, reaching anus, lower rays not thickened. Scales: weakly ctenoid, on body and head; in oblique rows above lateral line, about 70. Pores: on lateral line, 41 to 46. Colour: brown on dorsal surface; white on ventral surface; everywhere suffused with clear pale red; dark brown irregular blotches on body, 5, extending onto dorsal fin; dark brown on dorsal surface of head; very dark brown stripes radiating from eye, 2, upper ending in large blotch; brownish on caudal fin; jet black on peritoneum.

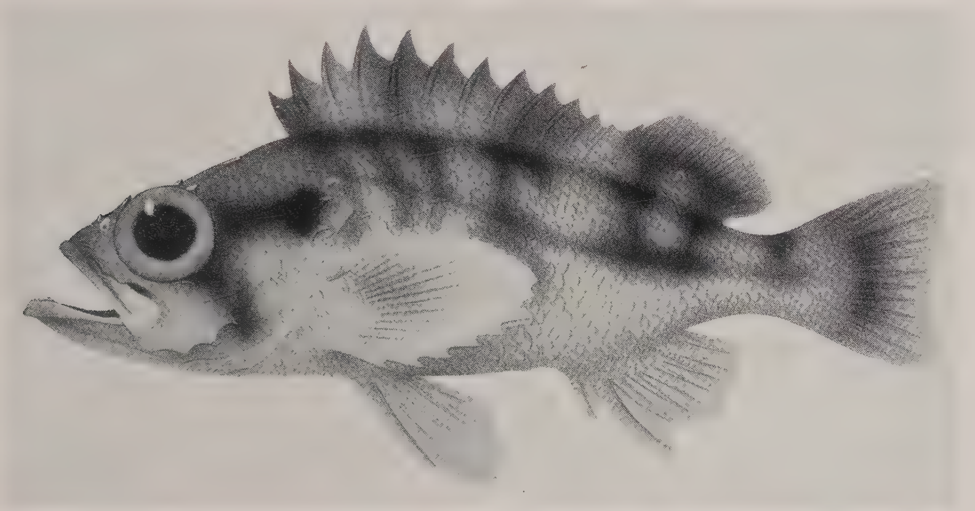

FIGURE 155. Big-eyed rock-fish. *Sebastodes zacentrus* (Gilbert) 1890

Length to 6½ inches.

Distinguished by the very large eyes, the slender body and the brownish coloration suffused with clear pale red.

The big-eyed rock-fish was first taken in British Columbia waters March 17, 1941, in Burrard inlet by a shrimp trawler at a depth of about 40 fathoms and was given to the second author. The specimen is 5⅜ inches in standard length and is now in the fish collection of the University of British Columbia. This is the only known individual from these waters.

Range southern California to southern British Columbia.

Brown rock-fish *Sebastodes dalii* (Eigenmann and Beeson) 1894

Body elongate; moderately slender; depth 2.6 to 3 in standard length. Head with upper profile nearly straight; mouth terminal, moderate; jaws nearly equal; symphyseal knob, small; interorbital space flat to concave, narrow; cranial ridges:

moderately developed, high, thick; cranial spines: nasal; prefrontal; frontals, II, III; parietal; moderately developed, slender, sharp; supracleithral; cleithral; opercular, 2; preopercular short, bluntly pointed; lacrymal lobes, 2, anterior little developed, spine on posterior lobe; rakers on first gill arch, 7 + 15 to 18, short. Fins: dorsal (1), XIII, 13 or 14, moderately notched, membranes of spinous portion moderately incised, longest spine about 2.3 in length of head; anal, III, 6, second spine equal to and stronger than third; pelvic, I, 5, thoracic, not reaching anus; pectoral, not reaching anus, lower rays thickened. Scales: weakly ctenoid; in oblique rows above lateral line, 61 or 62. Pores: on lateral line, about 49. Colour: light brown, much streaked with dusky; dark streaks radiating from eye, 4, vague; dark bars, 4, oblique, one from occiput across base of pectoral fin, two from spinous portion of dorsal fin—first from sixth and seventh spines toward anus—second from eighth to tenth spines toward lateral line, one broad, irregular, below rayed portion of dorsal fin toward lateral line; pale streak along lateral line, conspicuous on posterior two-thirds; dusky on all fins, least on pelvics; pale on peritoneum.

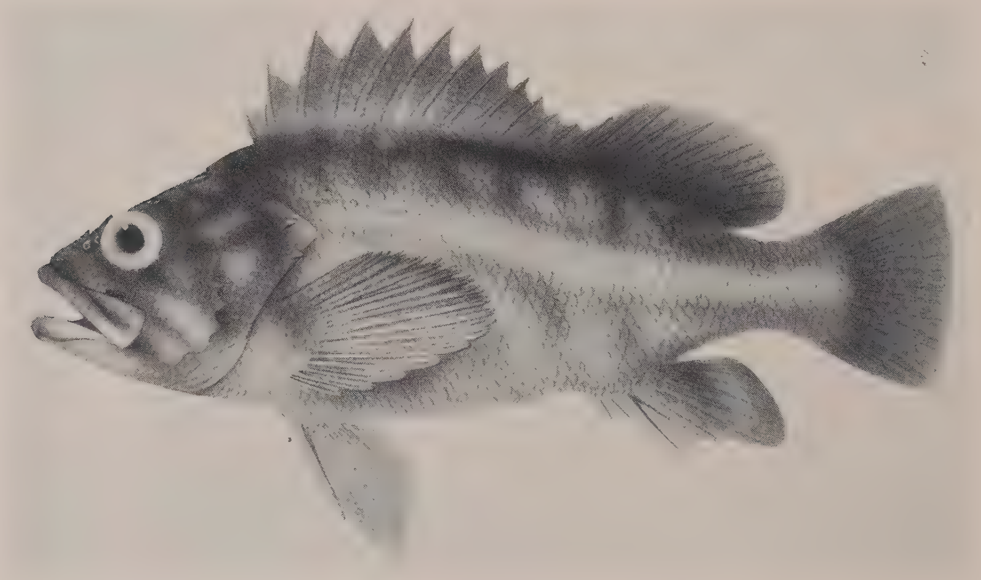

FIGURE 156. Brown rock-fish. *Sebastodes dallii* (Eigenmann and Beeson) 1894

Length to 14 inches.

Distinguished by the short pectoral fins, the 61 or 62 scales in oblique rows above the lateral line and the light brown coloration with four oblique dark rows across the body.

The brown rock-fish was first recorded from British Columbia waters in 1881 from the vicinity of Vancouver island by T. H. Bean as *Sebastichthys auriculatus*

(Girard), apparently on the basis of an earlier record by Theodore Gill. There seems to be little doubt but that this record is actually that of *Sebastodes dallii* which was described in 1894 by Eigenmann and Beeson. A second record is that of a specimen taken June 23, 1903, at Union bay by the *Albatross* and recorded in 1907 by B. W. Evermann and E. L. Goldsborough as *Sebastodes dalli* (Eigenmann and Beeson). The only other known occurrence of this species in these waters is that of an individual 14 inches in total length obtained January 20, 1942, in Jervis inlet which is now in the collection of the University of British Columbia.

Range southern California to southeastern Alaska.

Copper rock-fish *Sebastodes caurinus* (Richardson) 1844

Body elongate, moderately deep, depth 2.6 to 2.9 in standard length. Head with upper profile slightly curved; mouth terminal, moderate; lower jaw slightly projecting; symphyseal knob, very small; interorbital space slightly concave, narrow; cranial ridges: moderately developed; cranial spines: nasal; prefrontal; frontals, II, III; parietal; moderately developed, sharp; supracleithral; cleithral; opercular, 2; preopercular, upper 2 narrow, sharp, other 3 broad, sometimes bifid; lacrymal lobes, 2, spine on posterior lobe; rakers on first gill arch, 8 or 9 + 19 to 21, moderately short, stout, rough, somewhat clavate. Fins: dorsal (1), XIII, 12 to 14, deeply notched, membranes of spinous portion moderately incised, spines moderately high, length of longest spine 2 or more in that of head; anal, III, 6 or 7,

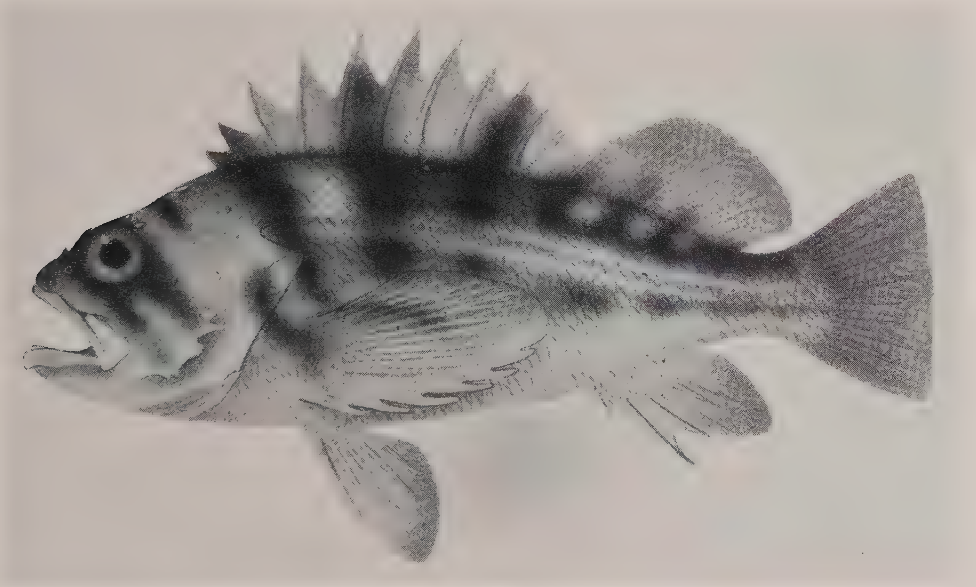

FIGURE 157. Copper rock-fish. *Sebastodes caurinus* (Richardson) 1844

second spine longer and stronger than third; pelvic, I, 5, thoracic, usually reaching anus; pectoral, reaching behind anus, lower rays slightly thickened. Scales: ctenoid; in oblique rows above lateral line, 40 to 48. Pores: on lateral line, 40 to 44. Colour: dark brown to dark green, more or less washed with copper or dull yellow, sometimes black with copper or yellow obscured; greenish brown stripes often radiating from eye, 2 or 3; black area in upper posterior angle of operculum; coppery black on all fins; white on peritoneum.

Length to 20 inches.

Distinguished by the long blackish pectoral fins with slightly thickened rays, the 40 to 48 scales in oblique rows above the lateral line and the coppery brown coloration.

The copper rock-fish was first taken in British Columbia waters July 26, 1881, in Departure bay, when two specimens were obtained at a depth of 20 fathoms by Capt. H. E. Nichols. These were recorded in the same year by T. H. Bean as *Sebastichthys caurinus* (Richardson). The species is abundant in the strait of Georgia and occurs along the coast of the Queen Charlotte islands. It is perhaps the most common rock-fish in shallow water in the strait of Georgia area. Commercial catches are made in gill-nets and sold as fillets.

Range Oregon to southeastern Alaska.

Orange-spotted rock-fish *Sebastodes maliger* (Jordan and Gilbert) 1880

Body elongate, stout, deep, depth 2.3 to 2.8 in standard length. Head with upper profile slightly curved; mouth terminal, large; jaws, nearly equal; symphyseal knob, small; interorbital space concave, narrow; cranial ridges: strongly developed, high, thick; cranial spines: nasal; prefrontal; frontals, II, III; parietal; strongly developed, moderately sharp; supracleithral; cleithral, 2; opercular, 2; preopercular short, narrow; lacrymal lobes little developed, spines absent; rakers on first gill arch, 8 to 10 + 19 to 22, short, stout, clavate. Fins: dorsal (1), XIII, 12 to 14, deeply notched, membranes of spinous portion between first and fifth spines very deeply incised so that attachment to front of each spine is less than half length of that spine, spines very high, higher than in any other species, length of longest spine about 1.8 in length of head; anal, III, 6 or 7, second spine equal to third in length and stoutness; pelvic, I, 5, thoracic, barely reaching anus; pectoral, reaching anus or behind, lower rays thickened. Scales: ctenoid; in oblique rows above lateral line, 47 to 55. Pores: on lateral line, 46 to 48. Colour: yellow to brown; usually yellow or orange on anterior of body, closely covered with small round spots of clear orange to brownish orange; darker brown to black on posterior of body, variously mottled; pale brownish stripes radiating from eye, 3, sometimes faint; pale to bright yellow area commencing on spinous portion of dorsal fin between third and fifth spines extending in form of wedge to lateral line, sometimes absent in adults; slaty black on rayed fins; pale on peritoneum.

Length to 2 feet.

Distinguished by the high dorsal fin with the deeply incised membranes and the yellow to brown coloration with the orange to brownish orange spotting.

The orange-spotted rock-fish was first taken in British Columbia waters August 5, 1881, at Campbell island (Port McLaughlin), when a specimen 15 inches in length was obtained at a depth of 14 fathoms by Capt. H. E. Nichols. This was recorded in the same year by T. H. Bean as *Sebastichthys maliger* Jordan and Gilbert. The species is common in the strait of Georgia at all depths down to 150 fathoms, the young occurring along the shores and the adults usually in deeper waters. Commercially the orange-spotted rock-fish is taken in trawls and marketed as fillets. As a sport fish it is taken on rod and line at depths between 30 and 40 fathoms with herring bait and provides excellent sport on light tackle because of its splendid fighting ability.

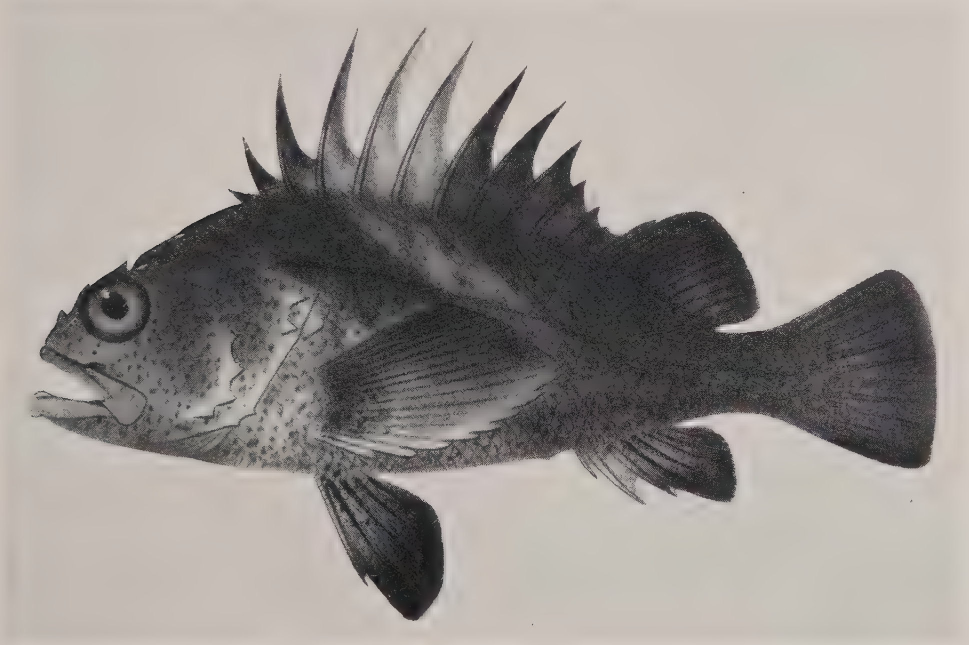

FIGURE 158. Orange-spotted rock-fish. *Sebastodes maliger* (Jordan and Gilbert) 1880

Range southern California to southeastern Alaska.

Yellow-striped rock-fish *Sebastodes nebulosus* (Ayres) 1854

Body elongate, deep, depth 2.5 to 2.75 in standard length. Head with upper profile nearly straight; mouth terminal, moderate; jaws about equal; symphyseal knob very small; interorbital space deeply concave, narrow; cranial ridges; strongly developed, high, blunt; cranial spines: nasal; prefrontal; frontals, II, III; parietal; strongly developed, sharp; supracleithral, large; cleithral, large; opercular, 2; preopercular, short, broad, points single; lacrymal lobes, 2, spines absent;

rakers on first gill arch, about 8 + 19, short, clavate. Fins: dorsal (1), XIII, 13, deeply notched, membranes of spinous portion moderately incised, highest spine about 2 in length of head; anal, III, 7, second spine longer, stronger, than third; pelvic, I, 5, thoracic, not reaching anus; pectoral, reaching anus, lower rays much thickened. Scales: ctenoid; in oblique rows above lateral line, 45 to 51. Pores: on lateral line, 42 to 46. Colour: blue black of varying intensities; bright yellow stripe commencing on membrane of spinous portion of dorsal fin between third and fourth spines, broad, passing obliquely backward to, thence along, lateral line to caudal fin; yellowish or whitish speckling, sometimes tinged with blue, everywhere on body and head; blue black on all fins; white on peritoneum.

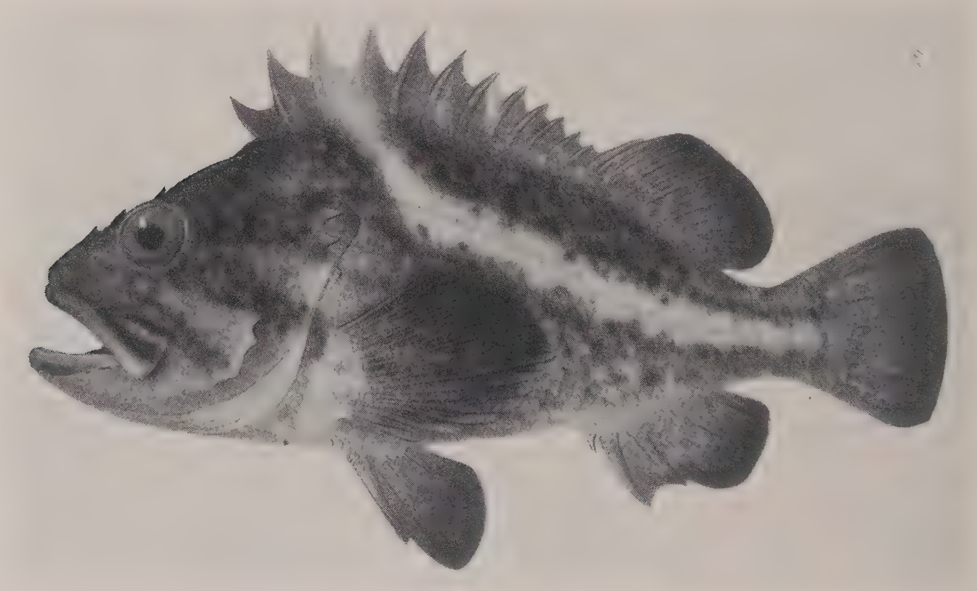

FIGURE 159. Yellow-striped rock-fish. *Sebastodes nebulosus* (Ayres) 1854

Length to 12 inches.

Distinguished by the broad bright yellow stripe on each side of the blue black body.

The yellow-striped rock-fish was first recorded from British Columbia waters in 1881 from Vancouver island by T. H. Bean as *Sebastichthys nebulosus* (Ayres). In 1882, T. Gill recorded a second individual on the basis of a colour sketch of a specimen observed May 20, 1859, at Mayne island in Deep bay and labelled *Sebastomus fasciatus* (Girard). A later definite locality record is that of a specimen 2½ inches in length taken June 23, 1903, off Fort Rupert by the *Albatross*, station 4204, lat. 50° 43′ N., long. 127° 19′ W., depth 69 fathoms and recorded in 1907 by B. W. Evermann and E. L. Goldsborough. The yellow-striped rock-fish occurs around Vancouver island, in Pender harbour and is obtained commonly in Hecate strait on halibut gear at moderate depths.

Range northern California to southeastern Alaska.

Banded rock-fish *Sebastodes nigrocinctus* (Ayres) 1859

Body elongate, deep, depth 2.6 to 2.8 in standard length. Head with upper profile nearly straight; mouth terminal, moderate; lower jaw slightly projecting; symphyseal knob, small; interorbital space concave, very narrow; cranial ridges: strongly developed, blunt, higher than in any other species of *Sebastodes:* median frontal ridges well developed, spinous; cranial spines: nasal; prefrontal; frontals, I, II, III, sometimes I and II fused; parietal; all strongly developed, short, sharp to blunt; accessory spines present; supracleithral, 1 or 2; cleithral, sometimes bifid; opercular, 2; preopercular short, upper 3 moderately sharp, lower 2 blunt; lacrymal lobes, 2, spines absent; rakers on first gill arch, 8 or 9 + 19 to 21, short, stiff, rough, clavate. Fins: dorsal (1), XIII or XIV, 14 or 15, slightly notched, membranes of spinous portion slightly incised, highest spine more than 2 in length of head; anal, III, 7, second spine slightly shorter and stronger than third; pelvic, I, 5, thoracic, barely reaching anus; pectoral, reaching anal fin in male, not reaching anus in female, lower rays somewhat thickened in female. Scales: ctenoid; in oblique rows above lateral line, 50 to 64. Pores: on lateral line, 44 to 50. Colour: gray to pale rose with 5 carmine vertical bars, or bright orange red with 5 jet black vertical bars, on each side of body; dark stripes downward and backward from eye, 2, prominent; white on peritoneum.

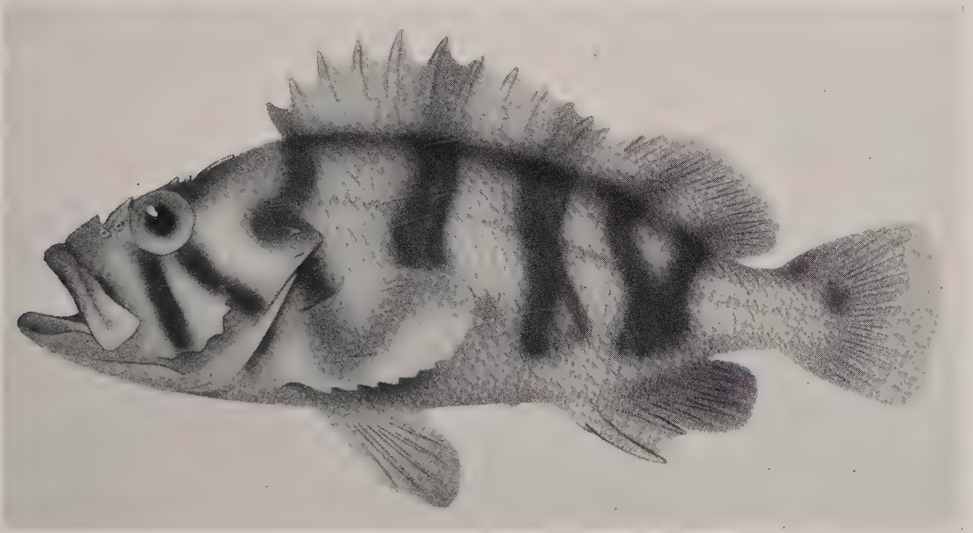

FIGURE 160. Banded rock-fish. *Sebastodes nigrocinctus* (Ayres) 1859

Length to 2 feet.

Distinguished by the high blunt cranial ridges, the well developed spinous median frontal ridges and the 5 well defined carmine or black vertical bars on each side of the body.

The banded rock-fish was first recorded from British Columbia waters in 1881 from Vancouver island by T. H. Bean as *Sebastichthys nigrocinctus* (Ayres). The species is taken occasionally in rather large numbers in Juan de Fuca strait. In February, 1940, several specimens were caught by lingcod fishermen in the strait of Georgia and in February, 1942, many were secured on dog-fish set-lines in Pender harbour at depths between 30 and 150 fathoms. During the winter of 1941-1942, three individuals captured in the strait of Georgia were maintained in the Vancouver Aquarium for some time. In the bright light they were in the colour phase with carmine bars but as the fish passed into a dark portion of the tank they changed to the colour phase with the jet black bars. This change and the reversal were effected in a matter of less than a minute. In November, 1944, three specimens, two males and a female, were obtained from a fish dealer in Victoria in the carmine phase. After a week's preservation in formalin only the males retained the vertical bars and these became brownish black. The banded rock-fish apparently is an inhabitant of the deeper waters and is not observed very frequently along the shore.

Range northern California to southeastern Alaska.

Spiny-cheeked rock-fish *Sebastolobus alascanus* Bean 1890

Body elongate, slender; depth about 3.5 in standard length. Head with upper profile slightly curved; mouth terminal, large; jaws about equal; symphyseal knob prominent; cranial ridges and spines numerous, strongly developed; cranial

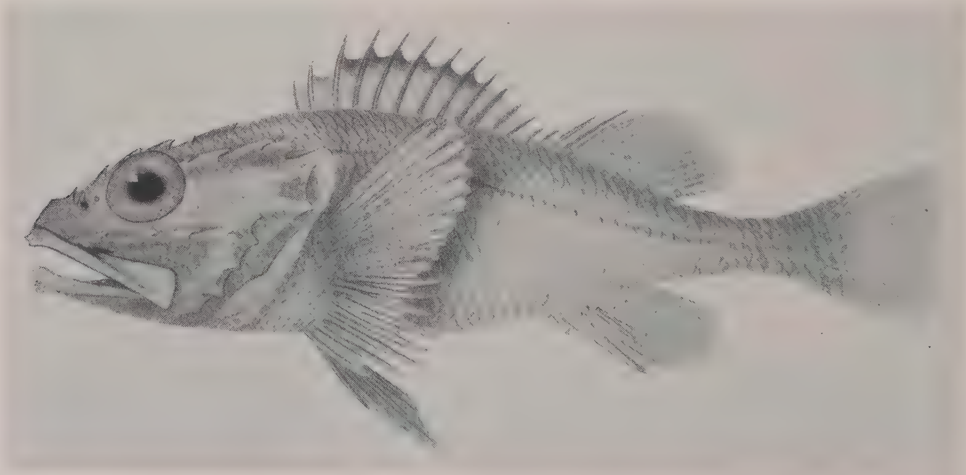

Figure 161. Spiny-cheeked rock-fish. *Sebastolobus alascanus* Bean 1890

spines: nasal; prefrontal; frontals, I, II, III; parietal; postorbital series sharp; supracleithral; cleithral; opercular, 2; preopercular, 5, uppermost longest; suborbital ridge sharp, knife-like, spines prominent; lacrymal lobes, 2, spine on posterior lobe; rakers on first gill arch, 18 to 22, short, stiff, rough, clavate. Fins: dorsal (1), XV to XVII, 9 or 10, very deeply notched, membranes of spinous portion deeply incised anteriorly, fourth or fifth spine longest, 3 to 4.3 in length of head; anal, III, 5, second spine equal to third, stronger; pelvic, I, 5, thoracic; pectoral, 20 to 22, large, lower portion extended to form distinct lobe of 7 to 9 exserted rays. Scales: ctenoid, large; in oblique rows above lateral line, 44 to 48; absent from branchiostegal membranes. Pores: on lateral line, 32 or 33. Cirri: nasal, 2, narrow, filamentous. Colour: uniform bright red; black markings on fins.

Length to 2 feet.

Distinguished by the knife-like spinous suborbital ridge on each side of the head, the lobed pectoral fins with the lower rays exserted and the large number of spines together with the small number of rays in the dorsal fin.

The spiny-cheeked rock-fish was first taken in British Columbia waters August 31, 1888, off Fort Rupert by the *Albatross*, station 2862, lat. 50° 49′ N., long. 127° 36′ W., depth 238 fathoms and recorded in 1926 by C. L. Hubbs. A second specimen was captured September 2, 1891, off Jordan river by the *Albatross*, station 3460, at a depth of 53 fathoms and recorded in 1895 by C. H. Gilbert. Additional individuals have been taken in the strait of Georgia in trawls at depths of 50 fathoms and greater. It is a deep-water species ranging down to 822 fathoms. An individual captured in March, 1941, in English bay was maintained in the Vancouver Aquarium until November of the same year. This fish is sometimes erroneously called the gurnard or gurnet by fishermen who consider it one of the choicest of the rock-fishes.

Range southern California to northwestern Alaska.

Family HEXAGRAMMIDAE Greenlings

In the greenlings the head is without ridges or spines but possesses cirri. There is a fully developed anterior nostril on each side; the posterior, if present, is reduced to a small pore. Multiple lateral lines are frequently present. The scales are cycloid or ctenoid and completely cover the body. The dorsal fin is single with 16 to 27 spines and 11 to 24 rays; the anal fin has 1 to 3 weak spines or none; the pelvic fins are thoracic, each with 1 spine and 5 rays.

The various members of the family usually have a bright coloration which evidently is associated with the prevailing hues of the seaweeds and rocks of the habitat. In some species there is a marked difference in the colours and colour patterns of the sexes.

Kelp greenling *Chiropsis decagrammus* (Pallas) 1810

Body elongate, moderately deep anteriorly; caudal peduncle slender. Head short, conical; mouth terminal, small; teeth small; nostril single; gill membranes united, free from isthmus. Fins: dorsal (1), XXI or XXII, 24, moderately notched; anal, I, 23 or 24, spine short, stout, closely applied to first ray; pelvic, I, 5, thoracic; caudal, slightly emarginate. Lateral lines: 5; first, from occipital region close to dorsal fin ending at point below middle of rayed portion (closer to dorsal fin than to second lateral line); second, from occipital region to base of caudal fin; third (usual lateral line), from immediately above opercle to base of caudal fin; fourth, from gill opening below pectoral, passing above pelvic, terminating near posterior end of anal fin; fifth, from isthmus, branching in front of anus, ending at base of caudal fin. Scales: ctenoid; covering body, top of head, cheeks and opercles. Cirri: 4, multifid, thick; supraocular, 2, prominent; occipital, 2, very small, each in slight depression almost midway on straight line from middle of front of eye to origin of dorsal fin. Colour in male: brownish olive, often tinged with blue or copper; blue spots on head and anterior part of body, each surrounded by reddish brown ring of small spots; mottled brown on dorsal fin; dusky blue on pelvic and anal fins; brown to black on pectoral fins, spotted with white giving appearance of transverse bars. Colour in female: from light brown, with small reddish spots, to light blue with rows of round orange spots; red to orange on dorsal fin, clouded with blue; orange or pale yellow on pectoral fins, without markings. In both sexes: conspicuous ocellus at posterior end of rayed portion of dorsal fin.

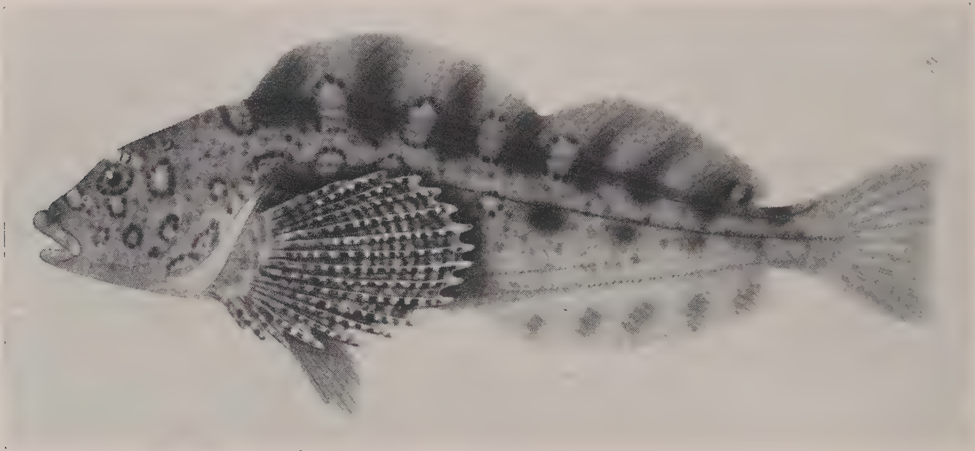

FIGURE 162. Kelp greenling. *Chiropsis decagrammus* (Pallas) 1810

Length to 21 inches.

Distinguished by the two pairs of cirri on the head, the single small spine at the front of the anal fin and the conspicuous ocellus on the posterior end of the rayed portion of the dorsal fin.

The kelp greenling was first recorded from British Columbia waters in 1866 by J. K. Lord, without date of capture or exact locality, as *Chirus constellatus* and

Chirus decagrammus (probably not distinguishing between male and female). The first definite record is that of three specimens taken September 13, 1881, in Nootka sound at Friendly cove by Capt. H. E. Nichols and recorded in the same year by T. H. Bean as *Hexagrammus decagrammus* (Pallas). The species is fairly common in British Columbia waters, particularly along the west coast of Vancouver island, and is found along rocky shores, reefs and around kelp beds. Spawning occurs in October and November when the pale blue eggs are laid in large masses. The food consists to a large extent of worms, crustaceans and small fishes. The kelp greenling is seldom brought to market by commercial fishermen but is caught by handlines and speared by Indians for food purposes. The flesh is very palatable, not unlike that of certain rock-fishes in flavour. This is one of the most strikingly coloured of our sea fishes and hence is sometimes erroneously called rock-trout and kelp-trout. The classic description of J. K. Lord bears quoting here:

> "THE CHIRUS . . . a handsome shapely fish, about eighteen inches in length. Its sides, though somewhat rough, rival in beauty many a tropical flower; clad in scales, adorned with colours not only conspicuous for their brilliancy, but grouped and blended in a manner one sees only represented in the plumage of a bird, the wing of a butterfly, or the petals of an orchid, this 'ocean swell' is known to the ichthyologist as the Chirus—the *Terpugh* (a file) of the Russians—the *Idyajuk* of the Aleutian Islands—the *Tath-le-gest* of the Vancouver Islanders.
>
> . . . to give the faintest conception of the colourings that adorn the chirus red, blue, orange, and green are so mingled, that the only thing I can think of as a comparison is a floating flower-bed, and even then the gardener's art, in grouping, is but a bungle contrasted with Nature's painting!"

Range southern California to northwestern Alaska.

White-spotted greenling *Hexagrammos stelleri* Tilesius 1809

Body elongate, rather slender; caudal peduncle slender, depth 3 or more in length of head. Head short, conical; mouth terminal, small; teeth small; nostril single; gill membranes united, free from isthmus. Fins: dorsal (1), XXII to XXV, 19 to 24, moderately notched; anal, 23 to 25; pelvic, I, 5, thoracic; caudal, slightly

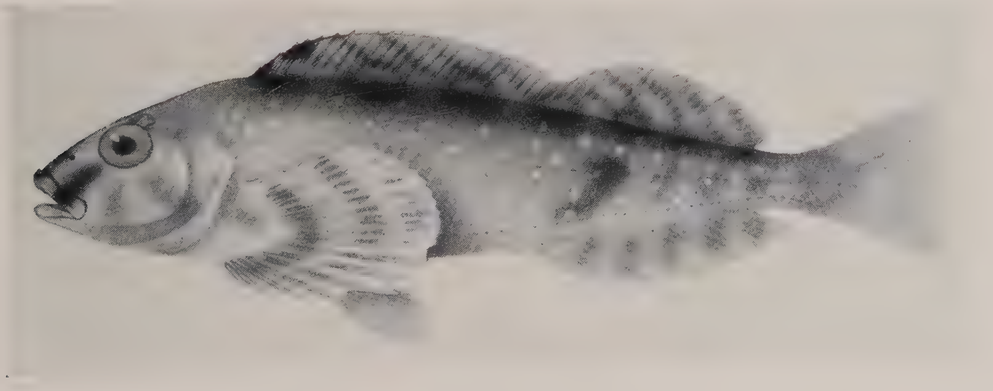

FIGURE 163. White-spotted greenling. *Hexagrammos stelleri* Tilesius 1809

emarginate. Lateral lines: 5; first short, from occipital region close to dorsal fin, ending at point below middle of spinous portion; second, from occipital region to base of caudal fin; third (usual lateral line), from immediately above opercle to base of caudal fin; fourth, very short, from gill opening below pectoral fin to point above pelvic fin; fifth, from isthmus, branching in front of anus, ending at base of caudal fin. Scales: ctenoid; covering body and top of head; cycloid, on cheek and opercle in 1 or more patches. Cirri: 2; supraocular, small, multifid, length less than diameter of eye. Colour: varying from light brown to green, sometimes tinged with pale red, barred or blotched with dusky; white spots conspicuous on body; pale yellow on anal fin with 6 dark bars; light reddish yellow on pectoral fins, barred with dark stripes.

Length to 16 inches.

Distinguished by the small cirrus above each eye, the conspicuous white spots on the body, the short first and fourth lateral lines and the slender caudal peduncle.

The white-spotted greenling was first recorded from British Columbia waters in 1866, without date of capture or locality, by J. K. Lord as *Chirus hexagrammus*. The first definite record is that of a specimen taken August, 1881, at Port Simpson by Capt. H. E. Nichols, and recorded in the same year by T. H. Bean as *Hexagrammus asper* Steller. The species occurs along the whole coast and is the commonest greenling in the strait of Georgia. It inhabits areas along the rocky shores but is also found frequently in shallow waters over sandy beaches. An individual spawned February 10, 1942, in the Vancouver Aquarium depositing a large cluster of light blue eggs on a rock. The food consists of worms, crustaceans and small fishes. Youthful anglers find this species a good sport fish and very inappropriately call it "tommy-cod" or "rock-trout." The flesh has a good flavour not unlike that of the best of the rock-fishes.

Range northern California to northwestern Alaska.

Fringed greenling *Lebius superciliosus* (Pallas) 1810

Body elongate, moderately deep; caudal peduncle stout, depth about 2 in length of head. Head short, conical; mouth terminal, small; teeth small; nostril single; gill membranes united, free from isthmus. Fins: dorsal (1), XX or XXI, 23 or 24, moderately notched; anal, 21 or 22; pelvic, I, 5, thoracic; caudal, rounded. Lateral lines: 5, first, from occipital region close to dorsal fin, ending at point below middle of rayed portion (closer to dorsal fin than to second lateral line); second, from occipital region to base of caudal fin; third (usual lateral line), from immediately above opercle to base of caudal fin; fourth, from gill opening below pectoral, passing above pelvic, terminating near posterior end of anal fin; fifth, from isthmus, branching in front of anus, ending at base of caudal fin. Scales: ctenoid, small covering body and top of head; cycloid on cheeks and opercles. Cirri: 2; supraocular, large, slender, multifid, length equal to, or greater than, diameter of eye. Colour: usually bright, extremely variable; ground colour dark green, brown or bright red, especially in adult; red stripes downward and backward from eye, 2; bright red on isthmus and branchiostegal membranes; dark conspicuous spot above base of pectoral fin; usually pale to bright round spots or blotches on sides of body which may be bright cherry red at times; brown, light green or red on pectoral fin, usually with 3 dusky crescent-shaped cross bands; sometimes red spots or bars on pelvic and anal fins; dull green on caudal fin margined with red.

Length to 2 feet.

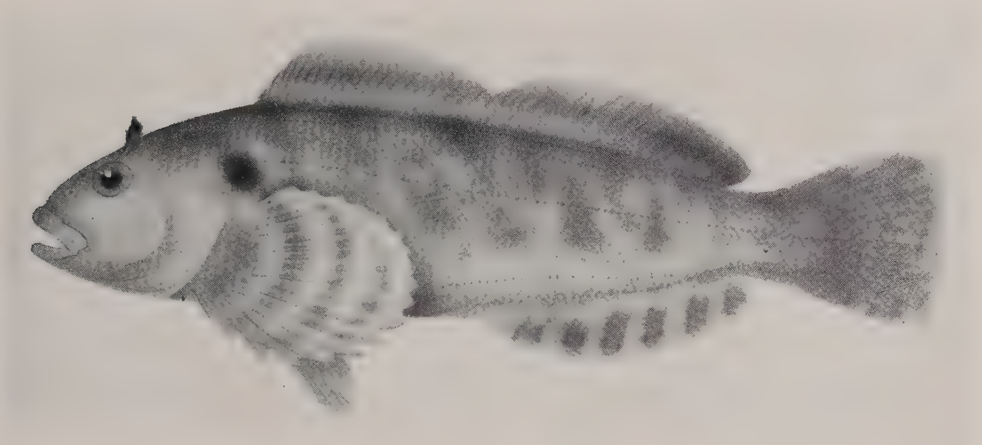

FIGURE 164. Fringed greenling. *Lebius superciliosus* (Pallas) 1810

Distinguished by the very large fringed cirrus above each eye and the round dark spot above the base of each pectoral fin.

The fringed greenling was first taken in British Columbia waters September 18, 1881, in Rose harbour by Capt. H. E. Nichols and was recorded in the same year by T. H. Bean as *Hexagrammus superciliosus* (Pallas). Other records are from Departure and English bays, the west coast of Vancouver island and Port Simpson. Undoubtedly it occurs in other localities.

Range southern California to northwestern Alaska.

Painted greenling *Oxylebius pictus* Gill 1862

Body elongate, moderately deep; caudal peduncle moderately stout. Head elongate, pointed, compressed; mouth terminal, small; maxillary not reaching to anterior margin of eye; teeth small; nostril single; preopercular spines, absent; gill membranes broadly united, free from isthmus. Fins: dorsal (1), XVI, 14 to 16, slightly notched; anal, III or IV, 12 or 13, notch between spinous and rayed portions, shallow; pelvic, I, 5, thoracic; caudal, somewhat rounded. Lateral line: nearly straight. Scales: ctenoid, small, covering body, head and opercle; cycloid on cheek. Cirri: 4, multifid; supraocular, 2, moderate; occipital, 2, small.

Colour: light brown to gray; dark bars, 7, vertical, across body, dorsal, anal and caudal fins; bars on pectoral and pelvic fins, irregular.

Length to 10 inches.

Distinguished by the elongate pointed head with two pairs of cirri, the small mouth, the single lateral line and the vertical dark bars on each side of the body.

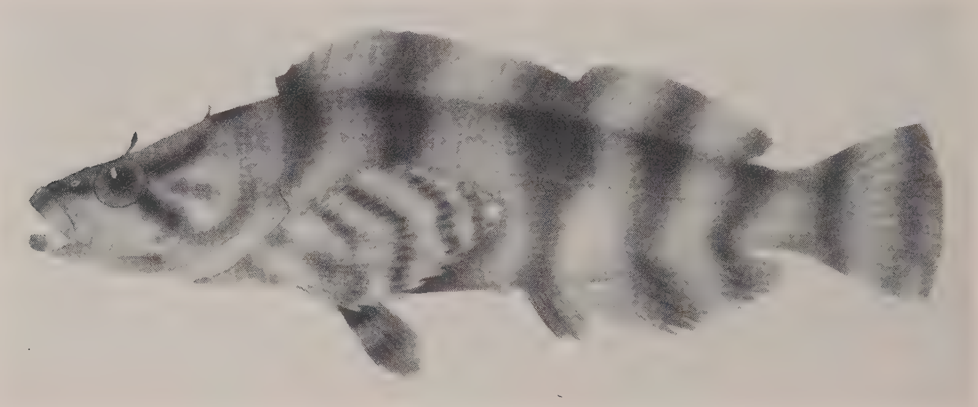

Figure 165. Painted greenling. *Oxylebius pictus* Gill 1862

The painted greenling was first recorded from British Columbia waters in 1881 by D. S. Jordan and C. H. Gilbert on the basis of a specimen seen in Saanich arm. The species occurs in the vicinity of Victoria and an occasional individual is captured in beach-seines in Departure bay. It may be more numerous than is indicated here as it does not take a bait even when it may be seen in its habitat along rocky shores and amongst seaweeds. As its name implies it is a strikingly marked fish and is sometimes called the "convict-fish" because of the vertical bars.

Range southern California to strait of Georgia.

Long-spined greenling *Zaniolepis latipinnis* Girard 1857

Body elongate, slender, tapering gradually to very slender caudal peduncle. Head short, conical; mouth terminal, small; maxillary reaching behind anterior margin of eye; teeth small; nostril single; preopercular spines, 3 to 5, upper two closely approximated, sharp; gill membranes united anteriorly, free from isthmus. Fins: dorsal (1), XX or XXI, I, 11 or 12, very deeply notched, first three spines with connecting membranes very low, first three spines elongate, second greatly prolonged, length about equal to half that of body; anal, III, 16 or 17, slightly notched between spinous and rayed portions, spines small, rays increasing in length to fourth last; pelvic, I, 5, thoracic, first two rays fleshy, extending beyond anus; caudal, slightly emarginate. Lateral line: somewhat high, following dorsal contour of body throughout its length. Scales: ctenoid, very small, firmly set in tough skin, covering body and head except portion of snout. Cirri: 4; supraocular, 2, small, multifid, often absent; maxillary, 2, small, on anterior tip. Colour: varying from olive green to light yellowish brown; brown or black spots on body, faint; dark spots in bars on all fins; black streak from front of eye to tip of snout.

Length to 12 inches.

Distinguished by the long second spine in the spinous portion of the dorsal fin, the rough scales firmly set in the tough skin and the thickened first two rays in each pelvic fin.

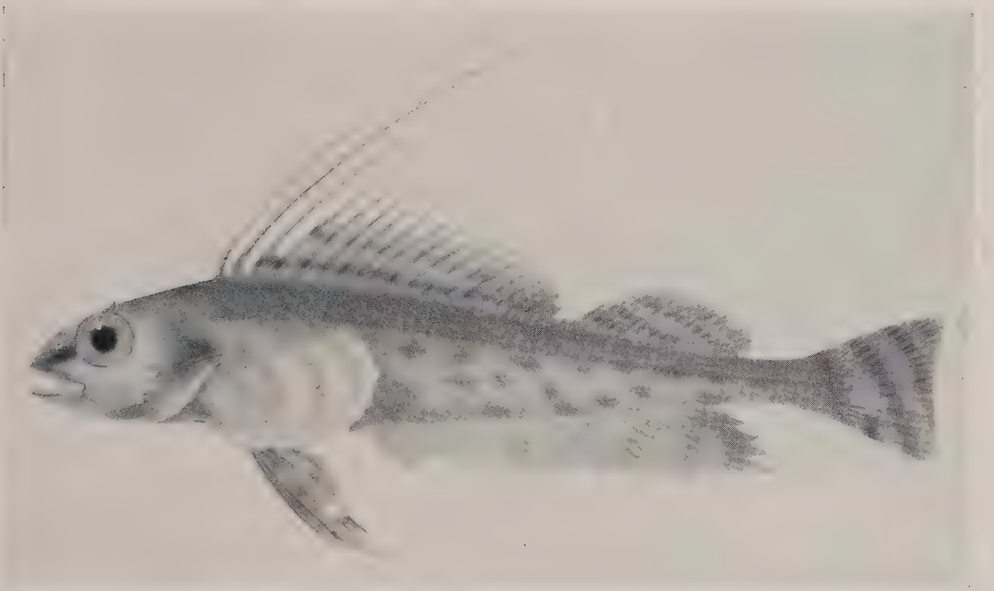

FIGURE 166. Long-spined greenling. *Zaniolepis latipinnis* Girard 1857

The long-spined greenling was first taken in British Columbia waters in 1889, in the strait of Georgia, and in 1890, near Victoria, and these specimens were recorded in 1898 by J. Fannin as being in the Provincial Museum at Victoria. Other individuals have been secured near Alberni, in Saanich inlet, near Nanaimo and in Nanoose bay. The long-spined greenling occurs at moderate depths down to 62 fathoms. It feeds to some extent upon crustaceans.

Range southern California to Vancouver island.

Lingcod *Ophiodon elongatus* Girard 1854

Body elongate, moderately deep; caudal peduncle slender. Head elongate, conical, depressed; mouth terminal, small; lower jaw projecting; maxillary reaching behind anterior margin of eye; teeth large, canine-like; nostril double, posterior small; preopercular spines, 3 to 5; gill membranes slightly united anteriorly, free from isthmus. In male, anal papilla small. Fins: dorsal (1), XXIV to XXVII, 21 to 24, moderately notched; anal, III, 21 to 24, spines buried in flesh in adult, third closely applied to first ray; pelvic, I, 5, thoracic; caudal, truncate. Lateral line: high on side of body bending slightly downward to midlateral position below rayed portion of dorsal fin, then straight. Scales: cycloid, small, covering body. Pores: tubular; on lateral line, 154 to 180. Cirri: 2, supraocular, large, thick, multifid. Colour: dark on dorsal surface, ranging from black, brown, blue to green; dusky greenish gray or dusky cream on ventral surface; frequently mottled on back, sides, and dorsal and caudal fins; grayish green on pectoral, pelvic and anal fins; males often with large dark greenish brown areas on back and sides outlined with tracings of pale blue or orange; females similarly marked but usually lighter, with orange tracings rather than blue, small orange spots scattered amongst the larger areas; colour and colour patterns varying with habitat and subject to rapid changes.

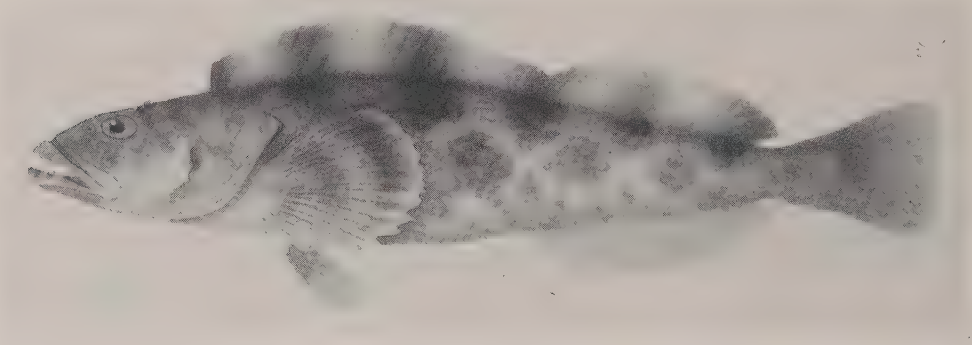

FIGURE 167. Lingcod. *Ophiodon elongatus* Girard 1854

Length to 5 feet.

Distinguished by the pelvic fins thoracic in position each with 1 spine and 5 rays, the long continuous notched dorsal fin, the small smooth scales covering the body and the head, the large mouth and teeth and the large fleshy cirrus above each eye.

The lingcod was first recorded from British Columbia waters in 1881 by D. S. Jordan and C. H. Gilbert on the basis of a specimen seen at Victoria. It is common along the northeastern shores of the Pacific with the centre of abundance in British Columbia waters. It is taken by trolling, in otter trawls and on jigs using live herring for bait. The habitat is near the bottom of the intertidal zone down to at least 60 fathoms, amongst kelp-beds, and reefs, especially where there are strong tidal movements. The fish when resting on the bottom supports its weight on its pectoral and pelvic fins. Spawning takes place from late December to February or March. The female deposits her eggs in a sheltered rocky location in large adhesive pinkish white masses below the lowest tide level. Individuals 34 and 46½ inches in length have been found to contain 170,000 and 476,000 eggs respectively. After fertilizing the eggs the male guards them until they are hatched. He fans the eggs with his pectoral fins to keep up a good circulation of water and drives off all enemies with fierce rushes, biting at any approaching intruder. The young hatch with a small yolk-sac attached and can be identified by the bright yellow oil globule near the liver, the large blue eyes and the elongate body. Little is known of the post-larval stages but young fingerlings from 3 to 5 inches in length are taken occasionally by seining in the eel-grass during the summer. Tagging operations have not indicated a regular migration but merely local random movements, the greatest distance recorded being 80 miles. The lingcod feeds chiefly upon herring and other fishes such as flounders, hake, cod, whiting and younger lingcod although various crustaceans and squid remains have been found in stomach contents. The juveniles feed upon copepods and other small crustaceans. The lingcod is highly esteemed as a fresh fish. It is used extensively in all restaurants and is available at all seasons of the year. The flesh of the adults is almost white and of the young is sometimes intensely green. The green colouring matter is not harmful and all trace of it disappears upon cooking. This fish has been found to be one of the richest sources of insulin amongst the fishes of the world. The liver oil is remarkably rich in vitamins "A" and "D", having the highest ranges of potency of any known fish or selachian oil from British Columbia waters so far assayed. The value of livers landed in 1942 was approximately $60,000.

Range southern California to northwestern Alaska.

Family ANOPLOPOMIDAE Skil-fishes

In the skil-fishes the head is without ridges, spines or cirri. There are two well developed nostrils on each side. The lateral line is single. The dorsal fins are two, the anterior composed of spines and the posterior with 1 or 2 spines preceding the rays; the pelvic fins are thoracic, each with 1 spine and 5 rays.

Included in this family are the sable-fish and skil-fish which differ widely in appearance from each other. They are fishes of the north Pacific.

Sable-fish *Anoplopoma fimbria* (Pallas) 1811

Body elongate, slightly compressed, tapering into rather long slender caudal peduncle. Head conical, rather elongate; mouth terminal, moderate; lower jaw included; maxillary very narrow, reaching to point below front of pupil; teeth small, cardiform, on jaws, vomer and palatines; nostril double; gill membranes united, joined to isthmus. Fins: dorsal (2), XVII to XXI—I, 16 to 19, well separated, interspace about twice diameter of eye; anal, III, 15 to 19, spines usually embedded in adult, difficult to locate, origin below that of rayed dorsal; pelvic, I, 5, thoracic; caudal, deeply emarginate. Lateral line: moderately high, following dorsal contour. Scales: weakly ctenoid, small, elongate, covering body and head; in oblique rows above lateral line, about 190. Cirri: absent. Colour: slaty black or greenish gray on dorsal surface, somewhat reticulated; light gray on ventral surface; pale on outer margins of all fins except spinous dorsal; black margin narrow, on spinous dorsal fin; black on lining of operculum. In young, colours brighter and more contrasting, often light green with dusky bars on dorsal surface.

Length to 3 feet 4 inches.

Distinguished by the well separated dorsal fins, the pelvic fins each with 1 spine and 5 rays, the long slender caudal peduncle and the black lining of each operculum.

The sable-fish was first recorded from British Columbia waters in 1872 from Vancouver island by W. Peters who described it as a new genus and species, *Scombrocottus salmoneus*. The second recorded occurrence is that of a specimen 13¼ inches in length which was taken August 2, 1881, in Kingcome inlet at a depth of 18 fathoms by Capt. H. E. Nichols and properly recorded in the same year by T. H. Bean as *Anoplopoma fimbria* (Pallas). This fish is fairly common in the strait of Georgia and very abundant northward. The methods of capture are, for the most part, by set-line and trawl in deep water. The spawning season is in the early spring. A partially spawned female was obtained March 4, 1941, off cape St. James. The eggs are pelagic. Postlarval individuals about an inch in length have been secured at the surface at distances of 100 and 185 miles off the coast of Oregon in the latter part of May. Frequently considerable numbers of small individuals, about 18 inches in length, are secured on hand-lines in various parts of the strait of Georgia in comparatively shallow water. Large individuals 3 feet in length and 40 pounds in weight have been captured on the halibut banks at depths down to 170 fathoms. The food is said to consist of crustaceans, worms and small fishes. The sable-fish is considered one of the best of the smoked fishes but is not sold fresh to any extent because of the high oil content. Small quantities are drysalted. The liver oil has a very high vitamin "A" and "D" content, ranking close to that of the lingcod. Various names have been applied to the sable-fish such as skil, coal-fish and black cod, the latter term being inappropriate since the fish is not a cod.

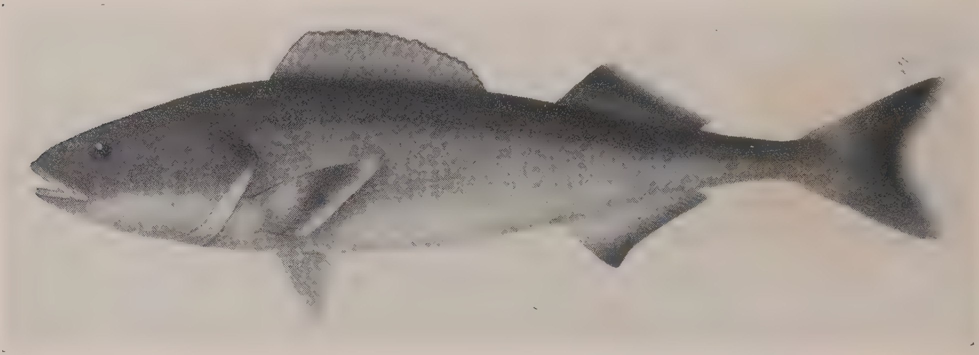

FIGURE 168. Sable-fish. *Anoplopoma fimbria* (Pallas) 1811

Range southern California to northwestern Alaska.

Giant skil-fish *Erilepis zonifer* (Lockington) 1880

Body elongate, stout, somewhat compressed. Head large; mouth terminal, moderate; lower jaw projecting; maxillary reaching to point about below centre of pupil; teeth slender; recurved on jaws; small on vomer and palatines; nostril, double; gill membranes united, joined to isthmus. Fins: dorsal (2), XII to XIV—I or II, 15 to 17, closely approximated, interspace equal to diameter of eyes or less, two spines in rayed fin may be inconspicuous or buried in flesh; anal, III, 11 to 14, origin posterior to that of rayed dorsal; pelvic, I, 5, thoracic; caudal, slightly emarginate. Lateral line: moderately high, following dorsal contour. Scales: ctenoid; covering body, head and soft-rayed fins; in oblique rows above lateral line, 122 to 134. Cirri: absent. Colour: very dark; black on dorsal surface and sides; gray to white on ventral surface; soiled white on margins of scales.

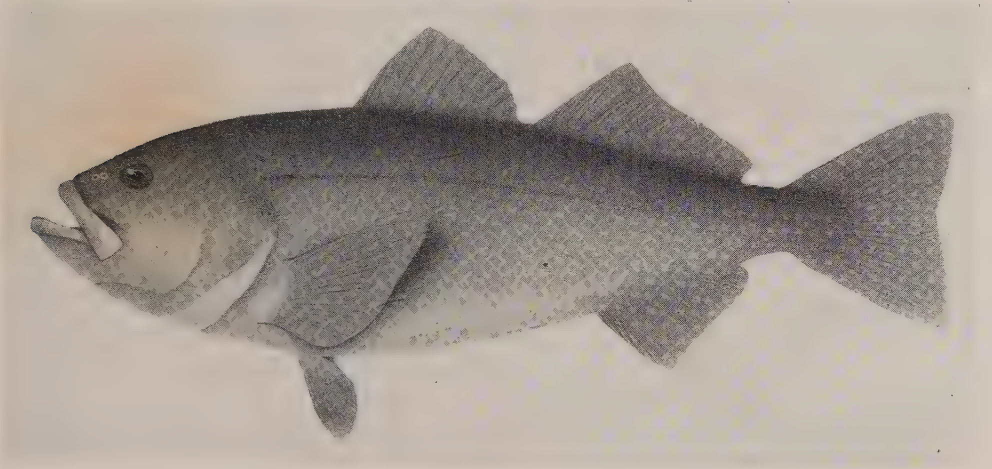

FIGURE 169. Giant skil-fish. *Erilepis zonifer* (Lockington) 1880

Length to 6 feet.

Distinguished by the approximated dorsal fins, the pelvic fins each with 1 spine and 5 rays, the anal fin with 3 spines and 11 to 13 rays and the scales on the rayed fins.

The giant skil-fish was first taken in British Columbia waters November 1, 1916, off the west coast of the Queen Charlotte islands and recorded in 1917 by W. F. Thompson. The three individuals were obtained on halibut gear at a depth of over 200 fathoms. One of them, a specimen 5 feet 9½ inches in length and weighing 159 pounds, was presented to the Provincial Museum by the Canadian Fishing Company. It is now represented in the Museum by a cast covered with the skin. An individual recorded in 1916 by W. F. Thompson as having been taken in Frederick sound or Chatham strait, Alaska, at a depth of 150 fathoms, was recorded again in 1917 as possibly having been captured off the west coast of the Queen Charlotte islands. The species is known to attain a weight of 200 pounds.

Range northern California to southeastern Alaska.

Family COTTIDAE — Sculpins

In the sculpins the head is usually large with the eyes placed high. The preopercle is armed with one or more spines, variously developed, sometimes antler-like. The scales, when present may be: typically ctenoid and never completely covering the body below the lateral line; or of various modifications of the reduced ctenoid type and may or may not completely cover the body below the lateral line; or the scales may be modified into thick tuberculate plates confined on the body to the lateral line. The pectoral fins are large, frequently procurrent; the pelvic fins, when present, are thoracic, each with 1 spine and 5, 4, 3, or 2 rays.

The colours in many species are extremely variable according to the environments. In some species there are marked colour differences between the sexes. In several tide-pool sculpins a striking similarity in colours and colour patterns may be exhibited by individuals of different species.

The majority of the sculpins are small fishes but a few attain large sizes. They inhabit tide-pools, shallow shore waters and also waters of considerable depths. A few species occur in fresh water and are known as bullheads, millers' thumbs and muddlers.

Giant marbled sculpin *Scorpaenichthys marmoratus* Girard 1854

Body elongate, stout. Head large; mouth terminal, large; snout bluntly rounded; spines: nasal, stout, sharp; preopercular, 3, upper 2 longest; gill membranes united, free from isthmus. Anus immediately in front of anal fin. Anal

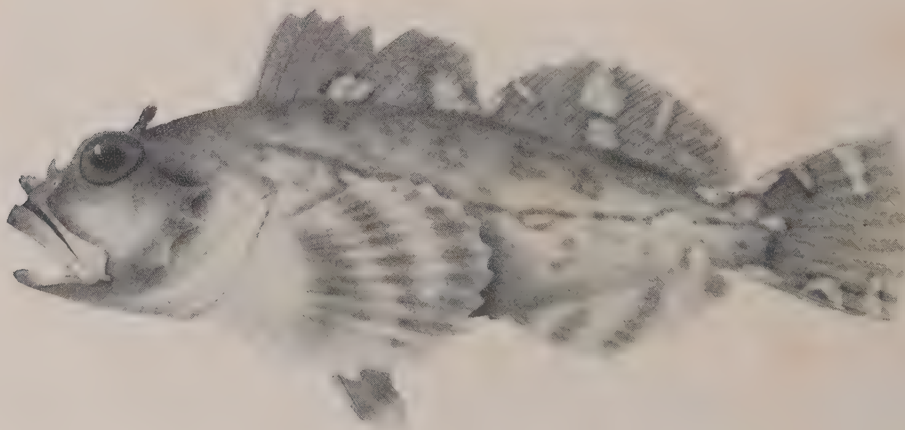

FIGURE 170. Giant marbled sculpin. *Scorpaenichthys marmoratus* Girard 1854

papilla small, rounded. Skin: thick, smooth. Fins: dorsal (1), VIII to XII, 15 to 18, deeply notched between spinous and rayed portions, spinous portion emarginate, membranes between first and fifth spines progressively more deeply incised; anal, 11 to 13; pelvic, I, 5, thoracic; caudal, truncate to rounded. Lateral line: slightly decurved, then straight. Scales: absent. Pores: on lateral line, 71 to 88. Cirri: premaxillary, 1, median, prominent, projecting forward from tip of snout; maxillary, 1, at posterior tip; supraocular, 1, large, lacinate, posterior in position. Colour: olive green to brown, mottled with large light areas frequently margined with darker shades of body colour, coloration exceedingly variable, changing rapidly with environment through shades of blue, green, to grayish black.

Length to 2 feet 6 inches.

Distinguished by the stout body, the smooth skin without scales, the prominent cirrus on the snout, the emargination of the spinous portion of the dorsal fin, the pelvic fins each with 1 spine and 5 rays and the large pale areas on the body.

The giant marbled sculpin was first recorded from British Columbia waters in 1881 by D. S. Jordan and C. H. Gilbert who reported having seen the species in Victoria. It is common along the whole coast to the Queen Charlotte islands at moderate depths, particularly in kelp beds. This is one of the largest of the sculpins. It is a bottom fish, sluggish in movement except when capturing prey. Spawning occurs during the winter months from January to March, the eggs being deposited in a large mass attached to a rock. The food consists of a varied diet of crustaceans, particularly crabs and shrimps as well as fishes and fish eggs.

Range southern California to northern British Columbia.

Brown Irish lord *Hemilepidotus spinosus* (Ayres) 1855

Body elongate, stout. Head large, broad; mouth terminal, large; snout bluntly rounded; spines: nasal large, stout, sharp; preopercular, 4, upper two simple, strong, sharp, lower two blunt, usually embedded in skin; opercular, 4,

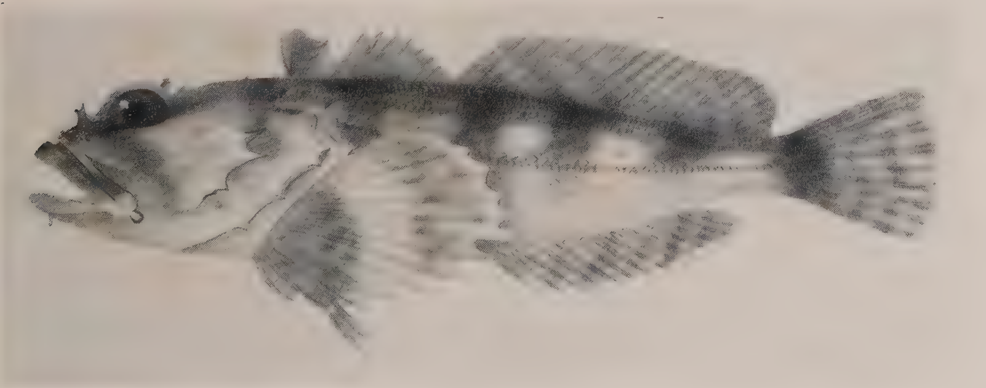

FIGURE 171. Brown Irish lord. *Hemilepidotus spinosus* (Ayres) 1855

short, sharp; gill membranes united, broadly joined to isthmus. Anus immediately in front of anal fin. Anal papilla small, rounded. Skin: thin, loose. Fins: dorsal (1), XI, 18 to 20, deeply notched between spinous and rayed portions, spinous portion emarginate; anal, 14 to 16; pelvic, I, 4, thoracic; caudal, rounded. Lateral line: high anteriorly, decurved to midline, then straight. Scales: ctenoid, small, some in pediculate papillae; in band closely encircling base of dorsal fin, six or seven rows in width diagonally at widest part; in row immediately above and contiguous with middle third of lateral line, about 19; on lateral line, 57 to 66, small; in rows of varying lengths below and contiguous with lateral line; in small patch behind base of pectoral fin. Cirri: on anterior third of lateral line, few, small, filamentous; on head: prenasal, nasal, postocular, postfrontal, occipital, opercular, maxillary, mostly multifid. Colour: brown, often tinged with red on dorsal surface, mottled and barred with dark brown; white on ventral surface.

Length to 10 inches.

Distinguished by the emarginate spinous portion of the dorsal fin, the bands of scales encircling the dorsal fin six or seven rows in width diagonally at the widest part and the gill membranes united and broadly joined to the isthmus.

The brown Irish lord has been taken but once in British Columbia waters. A single specimen, 5 inches in length, was obtained June 26, 1934, on Nootka island at Bajo point in a beach-seine, by Mr. E. G. Hart of the *Wm. J. Stewart* expedition. It is now in the collection of the Pacific Biological Station. The species is not uncommon along the California coast where it is caught in rather deep water and it is said to feed upon crustaceans.

Range southern California to Vancouver island.

Red Irish lord *Hemilepidotus hemilepidotus* (Tilesius) 1810

Body elongate, stout. Head large, broad; mouth terminal, large; snout bluntly rounded; spines: nasal, large, stout, sharp; preopercular, 4, upper two simple, strong, sharp, lower two blunt, usually embedded in skin; opercular, 4, short, sharp; gill membranes united, narrowly joined to isthmus. Anus immediately in front of anal fin. Anal papilla small, rounded. Skin: thick, firm. Fins: dorsal (1), X to XII, 18 to 20, moderately notched between spinous and rayed portions, spinous portion emarginate; anal, 13 to 16, pelvic, I, 4, thoracic; caudal, rounded. Lateral line: high anteriorly, decurved to midline, then straight. Scales: ctenoid, small, some in pediculate papillae; in band closely encircling base of dorsal fin, four rows in width diagonally at widest part; in row immediately above and contiguous with middle third of lateral line, about 17; on lateral line, 59 to 69, small; in rows of varying lengths below lateral line, separated from lateral line anteriorly; in triangular patch behind base of pectoral fin. Cirri: on anterior third of lateral line, small, filamentous; on head: prenasal, nasal, postocular, postfrontal, occipital, opercular, maxillary, multifid. Colour: dull to brilliant red on dorsal surface, more or less mottled, barred with brownish red; pale red to grayish green on ventral surface, profusely covered with rusty to black spots.

Length to 20 inches.

Distinguished by the emarginate spinous portion of the dorsal fin, the bands of scales encircling the dorsal fin four rows in width diagonally at the widest part and the gill membranes united and narrowly joined to the isthmus.

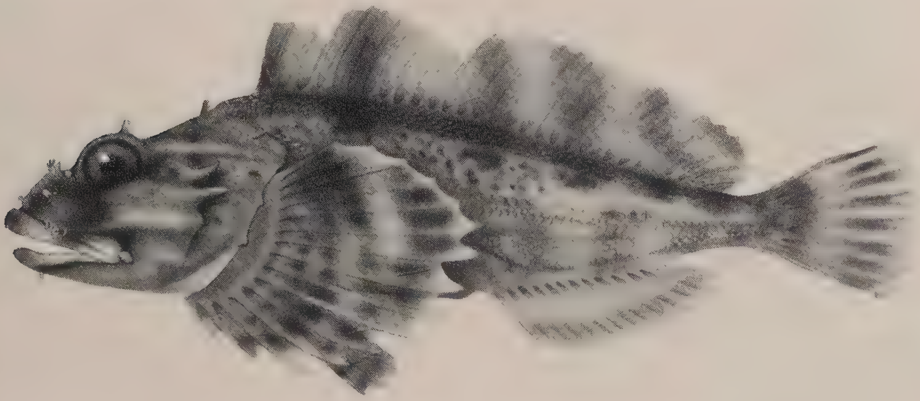

FIGURE 172. Red Irish lord. *Hemilepidotus hemilepidotus* (Tilesius) 1810

The red Irish lord was first taken in British Columbia waters in June, 1882, in Duncan bay near Port Simpson, by Capt. H. E. Nichols and recorded in 1883 by T. H. Bean as *Hemilepidotus trachurus* (Pallas). The species is common along the coast and is obtained frequently in shore-seines. The red Irish lord is one of the large sculpins and one to which the term "bullhead" is sometimes applied. It spawns in March, laying the pink eggs in masses. The food consists of crabs, shrimps, barnacles and mussels.

Range northern California to northwestern Alaska.

Silver spot *Blepsias cirrhosus* (Pallas) 1811

Body elongate, much compressed. Head compressed; mouth terminal, moderate, lower jaw barely included; snout blunted rounded; cranial ridges: posterior to eye, 3 blunt; spines: nasal, blunt; preopercular, 2, small, bluntly rounded; gill membranes united, free from isthmus. Anus one-third distance between insertion of pelvic fins and origin of anal fin. Anal papilla, small, rounded. Fins: dorsal (2), VI to IX—20 to 25, spinous fin emarginate, first three or four spines elevated, rayed fin long, high, higher than spinous fin; anal, 18 to 21; pelvic, I, 3, thoracic, short, spine short; pectoral, 12, low, narrow; caudal, rounded. Lateral line: high anteriorly, slightly decurved, then straight. Scales: reduced ctenoid, in form of minute plates, each with minute spine embedded in erect fleshy papilla, covering body except along lateral line, caudal peduncle and large silvery white areas on each side of body; on head in small scattered patches. Pores: on lateral line, 43 to 57. Cirri: long, slender; on snout, 3, two lateral, one median; on lower jaw, 6, three on each side. Colour: light olive brown or green of varying shades on dorsal surface; white to coppery yellow on ventral surface; black spots on upper anterior portion of body, 4 to 6, rounded; silvery white spots below lateral line anteriorly, 3 or 4, large, rounded; black bars radiating from eye, 3; black bar between eyes; brown to black with large translucent areas on all fins except pelvics.

Length to 7½ inches.

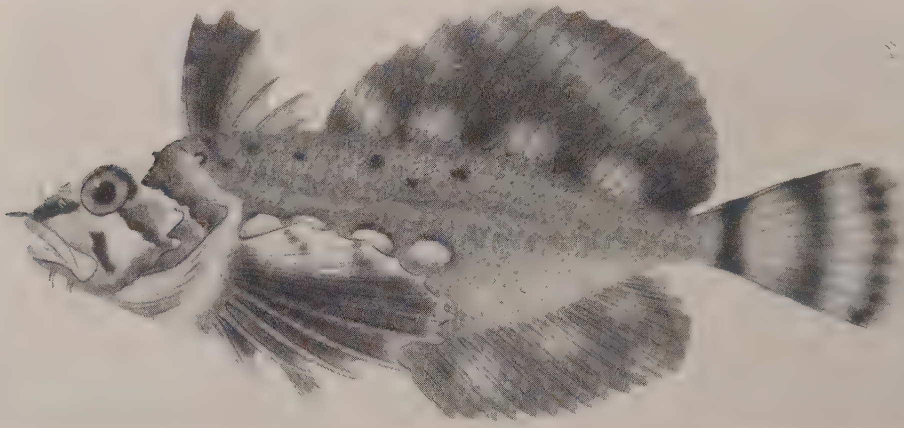

FIGURE 173. Silver spot. *Blepsias cirrhosus* (Pallas) 1811

Distinguished by the prominent cirri on the snout and on the lower jaw, the emarginate spinous dorsal fin, the high rayed dorsal fin, the silvery white spots on each side of the body, the translucent areas on the fins and the minute spines embedded in papillae.

The silver spot was first recorded from British Columbia waters in 1886 by J. F. Whiteaves on the basis of a specimen in the National Museum at Ottawa which may have been taken by Dr. G. M. Dawson. The species is common in the straight of Georgia and has been secured on the west coast of Vancouver island at Maquinna point, Alert bay and off Moresby island. Spawning occurs in the summer months. The eggs are a clear light brown colour and are attached in clusters to rocks in shallow water. This is one of the handsomest of the cottids. It is a shallow-water form, usually frequenting seaweed areas and is often captured in shrimp trawls at depths down to 20 fathoms.

Range northern California to northwestern Alaska.

Crested sculpin *Histiocottus bilobus* (Cuvier and Valenciennes) 1829

Body elongate, deep anteriorly, much compressed. Head conical, depressed; mouth terminal, moderate; snout bluntly rounded; cranial ridges: numerous, irregular, bluntly rounded, posterior to eye, 3, prominent, forming crest; spines: nasal, blunt; preopercular, 3, bluntly rounded, shorter than diameter of eye; gill membranes united, free from isthmus. Anus one-fifth distance between insertion of pelvic fins and origin of anal fin. Anal papilla small, rounded. Fins: dorsal (2), VIII or IX—21 or 22, spinous fin entire, rayed fin long, high, higher than spinous fin; anal, 18 to 20; pelvic, I, 3, thoracic, very short, spine short, stout; pectoral, 16, low, long; caudal, truncate. Lateral line: almost straight. Scales: reduced ctenoid; in form of minute round plates, each with spine in centre, embedded in thick conical fleshy papilla, covering body, head and bases of all fins except pelvics. Pores: on lateral line, about 52. Cirri: long, slender; on snout, 3, two lateral, one median; on lower jaw, 6, three on each side. Colour: olive green on dorsal surface; paler on ventral surface; dusky blotches across body, 4 or 5, faint; dusky bars on rayed dorsal, pectoral, anal and caudal fins.

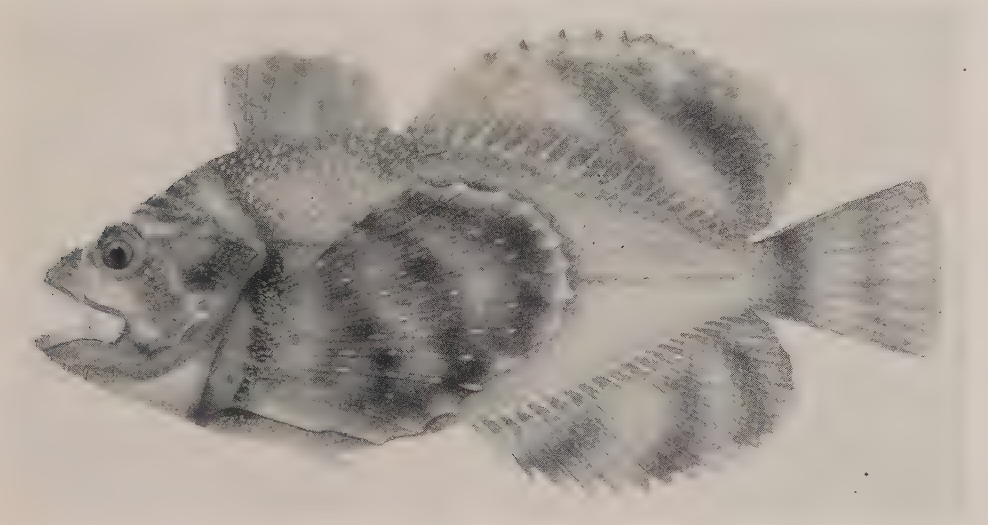

FIGURE 174. Crested sculpin. *Histiocottus bilobus* (Cuvier and Valenciennes) 1829

Length to 10 inches.

Distinguished by the prominent cirri on the snout and on the lower jaw, the entire spinous dorsal fin, the high rayed dorsal fin, the prominent cranial ridges and the conical fleshy papillae covering the scales.

The crested sculpin was first taken in British Columbia waters in September, 1938, in Dean channel, opposite Cascade inlet, by Captain Jack and is now in the collection of the Pacific Biological Station at Nanaimo. This is the only known specimen taken south of Alaska. Nothing is known of the life history.

Range northern British Columbia to northwestern Alaska.

Plumose sculpin *Artedius harringtoni* (Starks) 1896

Body elongate, slender to stout. Head moderate to large, depressed; mouth terminal, moderate to large; teeth on jaws, in male, large anteriorly, cardiform posteriorly, in female, small; snout bluntly rounded; eye, large; spines: nasal, long; preopercular, 2, upper broad or weakly bifid, often covered with thick skin, lower minute; gill membranes united, free from isthmus. Anus, in male, about midway between insertion of pelvic fins and origin of anal fin, in female, immediately in front of anal fin. Anal papilla in mature male large, cylindrical, with small conical tubular filament asymmetrically placed at tip, in immature male small, conical. Fins: dorsal (2), IX or X—16 to 18; anal, 10 to 14; pelvic, I, 3, thoracic; caudal, truncate. Lateral line: slightly decurved, then straight. Scales: ctenoid; in broad band on upper part of body 8 to 10 rows in width diagonally at widest part, not contiguous with lateral line, extending backward almost to origin of caudal fin, bands of each side meeting behind rayed dorsal fin; in longitudinal series, 38 to 51; on lateral line, 35 to 39; on head, in patches. Cirri: on lateral line, paired or single, short, filamentous, 1 to 3 on each scale pocket, in anterior portion; on head, supraocular, 2, in male multifid, anterior very large, posterior large, in female, anterior small, filamentous, posterior small, bifid or multifid; behind eye, several, short, filamentous. Colour in male: brownish olive on dorsal surface; dusky cream on ventral surface; dark saddles across back, 5 to 7; white spots on lower portion of body numerous, round, sometimes not clear-cut, lower spots often incomplete; brilliant orange yellow on ventral surface of head in adults; inconspicuously mottled with reddish brown on dorsal, pectoral and caudal fins; golden yellow on anal fin with interlocking series of white hexagons. Colour in female: brown to olive brown on dorsal surface; creamy white on ventral surface; dark saddles across back, 5 to 7; white spots on lower portion of body and head

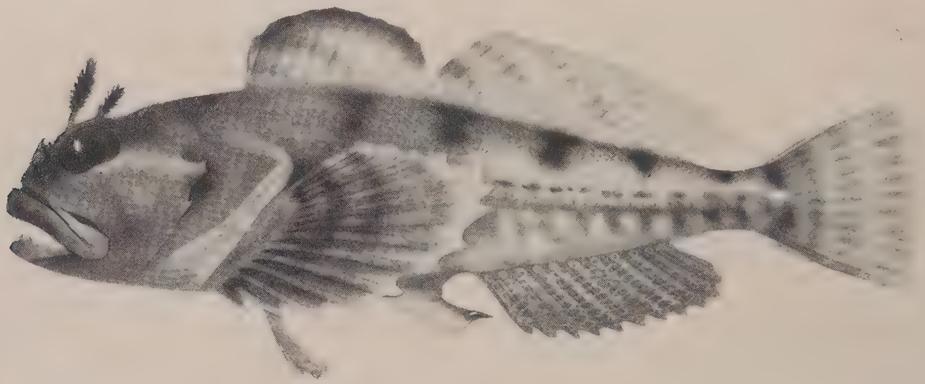

FIGURE 175. Plumose sculpin. *Artedius harringtoni* (Starks) 1896

numerous, round, clear-cut, on sides becoming larger below, lower spots often incomplete, fusing with white of ventral surface; white to pink or red on pelvic and anal fins; dark streaks on other fins, wavy; white spot on caudal peduncle conspicuous in male, less so in female.

Length to 4 inches.

Distinguished by the bifid partially embedded upper preopercular spine on each side of the head, the band of scales along the upper side of the body meeting its fellow on the opposite side behind the rayed dorsal fin, the scales on the top of the head, the large cardiform teeth and the pattern of white hexagons on the golden yellow anal fin of the mature male and the row of complete and incomplete white spots along the ventral margin of the dark pigmentation of the body of the female.

The plumose sculpin was first taken in British Columbia waters in July, 1909, in Barkley sound at Ucluelet, at low tide by Mr. C. H. Young and recorded in 1920 by B A. Bean and A. C. Weed as the type of a new genus and species, *Pterygiocottus macouni*, on the basis of a male specimen 3¼ inches in length. Dr. R. L. Bolin has shown recently that this species is actually the mature male of *Artedius harringtoni*. The male at maturity becomes robust, develops a large head, enlarged anterior teeth and very large plumose cirri and assumes a series of colours and colour patterns quite unlike the female or the immature male. In 1911, Dr. E. C. Starks recorded a specimen from Nanaimo as *Axyrias harringtoni* Starks. The species is taken rather infrequently near Nanaimo, in Burrard inlet and English bay and in the Queen Charlotte islands area. It occurs at moderate depths and in most cases has been secured in beam trawls.

Range southern California to northern British Columbia.

Padded sculpin *Artedius fenestralis* Jordan and Gilbert 1882

Body elongate, stout anteriorly, slender posterior to anus. Head large, depressed, broad; mouth terminal, large; snout blunt; spines: nasal short, sharp, recurved; preopercular, 3, frequently covered with skin, uppermost enlarged, with 3 spinules; gill membranes united, free from isthmus. Anus immediately in front of anal fin. Anal papilla very small, conical. Fins: dorsal (2), VIII or IX—16 to 18; anal, 12 to 14; pelvic, I, 3, thoracic; caudal, truncate to rounded. Lateral line: gradually decurved, then straight. Scales: weakly ctenoid, in fleshy pad-like papillae; on upper part of body in broad band about 9 rows in width diagonally at widest part, extending backward almost to origin of caudal fin, bands of each side meeting behind rayed dorsal fin, in longitudinal series, 26 to 29; on lateral line, 35 to 37, small, deeply embedded, smooth except for few at anterior end; on head, stellate, in small patch in postocular and subocular regions. Cirri: on lateral line, slender, filamentous; on head few, small, filamentous, except for multifid pairs with bulbous bases behind eyes. Colour: extremely variable, variously orange, yellow, light green, occasionally cream on dorsal surface; dusky on ventral surface of male, cream to pale brown on ventral surface of female; green, brown or black saddles across body, 4, one below spinous dorsal fin, two below rayed dorsal fin, one at base of caudal fin; white spots on body irregularly scattered; green, brown or rusty bars on fins except pelvics and anal; dusky to black on pelvic and anal fins in male; cream to pale brown on pelvic and anal fins in female; in male: black spots on spinous dorsal fin, 2, anterior small, posterior large; breeding colours: body becomes very dusky to almost black, particularly on lower portion, other colours become very intense; black spots on spinous dorsal fin joined by three bands of colour, upper dusky, middle pale blue, lower golden yellow.

Length to 5½ inches.

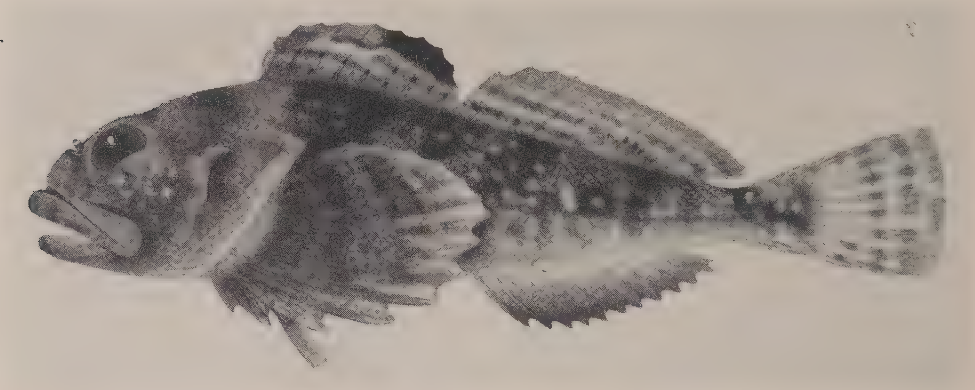

FIGURE 176. Padded sculpin. *Artedius fenestralis* Jordan and Gilbert 1882

Distinguished by the enlarged uppermost preopercular spine with the 3 spinules partly or entirely covered with skin, the stellate scales on the head, the dorsal band of scales in fleshy pad-like papillae meeting its fellow behind the rayed dorsal fin and the smooth embedded scales on each lateral line.

The padded sculpin was first taken in British Columbia waters July 27, 1881, in Drew harbour by Capt. H. E. Nichols and recorded in the same year by T. H. Bean as *Artedius notospilotus* Girard. In 1910 a specimen was obtained in the strait of Georgia by Mr. W. Spreadborough and was recorded in 1920 by B. A. Bean and A. C. Weed as *Astrolytes fenestralis* (Jordan and Gilbert). The padded sculpin is abundant in the strait of Georgia and Burrard inlet and has been captured at Ucluelet. It inhabits waters down to 30 fathoms. Spawning occurs from January to March, the female depositing salmon-coloured eggs. The food consists to a considerable extent of shrimps and small fishes.

Range northern California to northwestern Alaska.

Round-nosed sculpin *Artedius lateralis* (Girard) 1854

Body elongate, moderately stout; lower profile nearly straight. Head much depressed, broad; mouth terminal, moderate; snout bluntly rounded, in dorsal view; spines: nasal, short, blunt; preopercular, 1, strongly bifid, covered with skin; gill membranes united, free from isthmus. Anus immediately in front of anal fin. Anal papilla small, bluntly conical. Fins: dorsal (2), VIII to X—16 or 17; anal, 12 to 14; pelvic, I, 3, thoracic; caudal, truncate to rounded. Lateral line: slightly decurved, then straight. Scales: weakly ctenoid; on upper part of body in broad band 7 or 8 rows in width diagonally at widest part, not contiguous with lateral line, terminating before posterior end of rayed dorsal fin, in longitudinal series, 24 to 31; on lateral line, 35 or 36, embedded in skin; on head, none. Cirri: along anterior of lateral line, slender, filamentous, sometimes paired; on nasal spine, small, multifid; on dorsal surface of head, numerous, small, slender. Colour: olive green to dark brown on dorsal surface; cream to faint green on ventral surface; dark saddles across back, 6, light between first two; pale cream spots on lower portion of body and head numerous, roundish, becoming larger below, lower spots often incomplete, fusing with cream of ventral surface of body; conspicuous dark bars on all fins except pelvics. In male: small black spot on membrane of spinous dorsal fin between first and second spines; in breeding season duskiness pronounced.

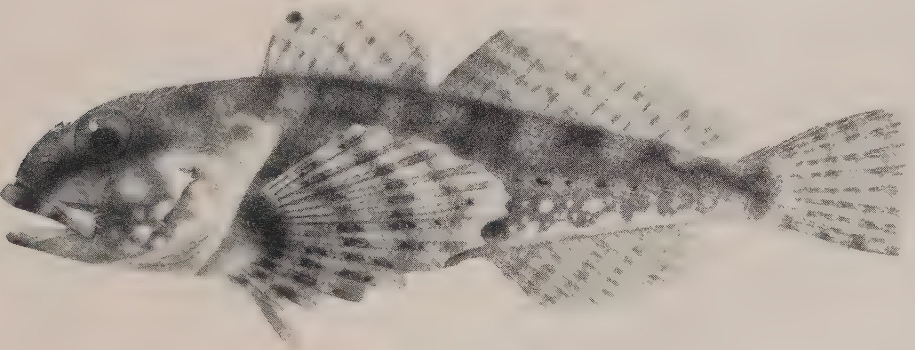

FIGURE 177. Round-nosed sculpin. *Artedius lateralis* (Girard) 1854

Length to 5 inches.

Distinguished by the bifid preopercular spines, the straight lower profile of the body, the bluntly rounded snout as viewed from above, the depressed head without scales, the narrow band of scales on the upper part of each side of the body terminating before the posterior end of the rayed dorsal fin and the embedded scales on the lateral lines.

The round-nosed sculpin was first taken in British Columbia waters in 1893 at Comox by Mr. J. Macoun and recorded in 1920 by B. A. Bean and A. C. Weed. However the first published record is 1901 for the Queen Charlotte islands by W. H. Osgood. The species is generally distributed along the coast in tide-pools and shallow water. Spawning occurs in February. The small bright cherry red eggs are deposited in a mass in a protected location amongst rocks and hatch in about sixteen days.

Range southern California to Queen Charlotte islands.

Rough-backed sculpin *Chitonotus pugetensis* (Steindachner) 1877

Body elongate, moderately slender. Head moderate; mouth terminal, large; snout bluntly rounded; spines: nasal, small, sharp; sphenotic, 2 or 1; parietal, 1; preopercular, 4, uppermost stout, antler-like, with 3 upwardly directed spinules; gill membranes united, free from isthmus. Anus midway between insertion of pelvic fins and origin of anal fin. Anal papilla stout, narrower posteriorly, ending in curved tip with slender tubular filament attached near end. Fins: dorsal (2), X or XI — 14 to 17, spinous fin deeply emarginate, first spine longest, second and third successively shorter; anal, 14 to 17; pelvic, I, 3, thoracic; caudal, slightly rounded. Lateral line: slightly decurved, then straight. Scales: ctenoid; covering body above lateral line; on lateral line, 36 to 39, large, rough. Cirri: nasal, 1, conspicuous, broad; on eyeball, 1, small, slender, filamentous; postocular, 1, moderate, broad. Colour: dark grayish green to brown with series of dark brown to black blotches on dorsal surface; white below lateral line; brownish red area often present behind base of each pectoral fin below lateral line and brilliant red blotch below anterior portion of rayed dorsal fin, especially during breeding season; dusky on margins of dorsal fins.

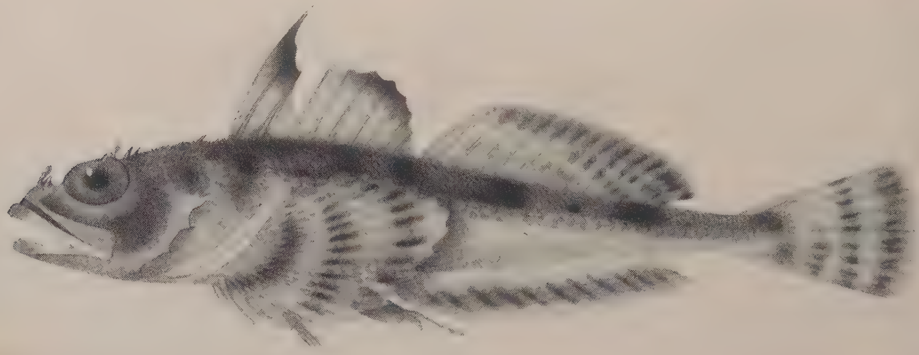

FIGURE 178. ROUGH-backed sculpin. *Chitonotus pugetensis* (Steindachner) 1877

Length to 9 inches.

Distinguished by the emarginate spinous dorsal fin and the rough scales completely covering the body above the lateral line on each side.

The rough-backed sculpin was first taken in British Columbia waters in July, 1906, at Port Simpson and the specimen is now in the collection of the

Pacific Biological Station at Nanaimo. The first published record is that of two individuals collected in June, 1909 at Ucluelet by Messrs. C. H. Young and W. Spreadborough and recorded in 1920 by B. A. Bean and A. C. Weed. The species is common in the strait of Georgia in waters of moderate depth, probably not much beyond 40 fathoms. The food consists to a large extent of shrimps and other crustaceans.

Range southern California to northern British Columbia.

Northern sculpin *Icelinus borealis* Gilbert 1895

Body elongate, rather slender. Head moderate; mouth terminal, moderate; snout bluntly rounded; spines: nasal, short, sharp; preopercular, 3, uppermost stout, antler-like, with 3 to 6 upwardly directed spinules; gill membranes united, free from isthmus. Anus three-quarters distance between insertion of pelvic fins and origin of anal fin. Anal papilla small, short, conical. Fins: dorsal (2), IX or X — 15 to 17, spinous fin not emarginate, none of spines elongate; anal, 12 to 14; pelvic, I, 2, thoracic, short, frequently curved; caudal, truncate to rounded. Lateral line: slightly decurved, then straight. Scales: ctenoid; on upper part of body in two rows close to dorsal fins beginning below first or second spine, upper row ending behind rayed fin, lower row not extending to end of rayed fin; on lateral line, 37 to 40, rough. Cirri: along lateral line, filamentous; on head, nasal, 1, long, slender, supraocular, 1, moderate, multifid; elsewhere numerous, filamentous, slender. Colour: dark olive gray or brown on dorsal surface; white to cream on ventral surface, sometimes with fine red reticulations; dark saddles across body, 4, one below spinous dorsal fin, two below rayed dorsal fin, one at base of caudal fin; brown bars narrow, on lips, cheeks and all fins except pelvics and anal. In male: jet black spots on spinous dorsal fin, 2, anterior long, narrow, posterior large, nearly round, spots sometimes connected.

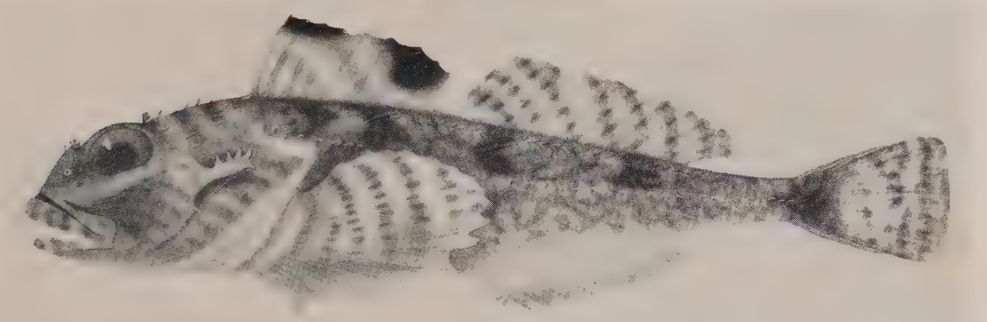

FIGURE 179. Northern sculpin. *Icelinus borealis* Gilbert 1895

Length to 4 inches.

Distinguished by the antler-like uppermost preopercular spines each with 3 to 6 upwardly directed spinules, the numerous slender filamentous cirri on the head and the double row of scales below the dorsal fins the upper of which extends beyond the posterior end of the rayed dorsal fin to meet the corresponding row of the opposite side.

The northern sculpin was first taken in British Columbia waters September 2, 1891, west of Jordan river by the *Albatross*, station 3460, lat. 48° 25′ N., long. 124° 10′ W., depth 53 fathoms and recorded in 1895 by C. H. Gilbert. Many specimens have been secured off the south and west coasts of Vancouver island, in the strait of Georgia and in Burrard inlet. The species is found at depths from 10 to 60 fathoms The food consists to a considerable extent of shrimps.

Range Puget sound to northwestern Alaska.

Lesser filamented sculpin *Icelinus tenuis* Gilbert 1890

Body elongate, rather slender. Head moderate; mouth terminal, moderate; snout bluntly rounded; spines: nasal, moderate, sharp; parietal, 2; preopercular, 4, uppermost stout, antler-like, with 4 or 5 upwardly directed spinules; gill membranes united, free from isthmus. Anus two-thirds distance between insertion of pelvic fins and origin of anal fin. Anal papilla very small, conical. Fins: dorsal (2), IX or X — 16 to 19, first spine elongate, filamentous, reaching middle of rayed dorsal fin, second spine shorter; anal, 13 to 17; pelvic, I, 2, thoracic; caudal, truncate to rounded. Lateral line: sharply decurved, then straight. Scales: ctenoid; on upper part of body in two rows close to dorsal fins, beginning below middle of spinous fin or slightly behind, ending approximately below fourth or fifth ray of rayed fin, in each row, 9 to 14; on lateral line, 38 to 43, rough. Cirri: along lateral line, small, filamentous; on head, nasal, absent, supraocular, 1,

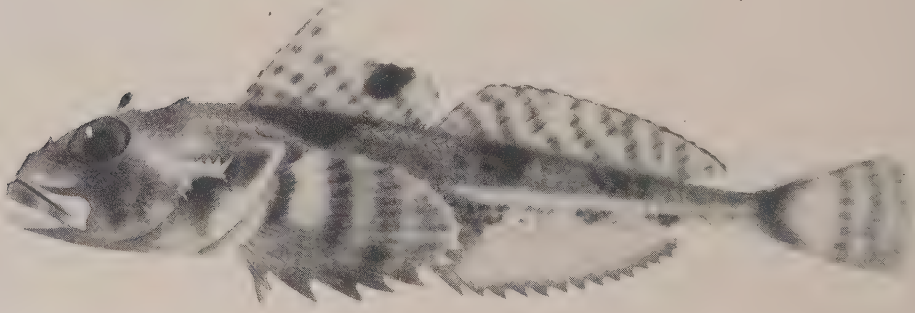

FIGURE 180. Lesser filamented sculpin. *Icelinus tenuis* Gilbert 1890

moderate, flattened, multifid, on various other parts of head, slender, filamentous. Colour: light brown on dorsal surface, variously blotched with orange; creamy white on ventral surface with dusky blotches below lateral line; dark saddles across upper part of body, 4, one below spinous dorsal fin, two below rayed dorsal fin, one at base of caudal fin; jet black on supraocular cirri; bright yellow on lateral line cirri; white to cream, variously barred with orange to brown, on all fins except pelvics and anal; dusky on margins of dorsal and anal fins; male with large black spot about the sixth spine of spinous dorsal fin; white band near base of each pectoral fin, prominent.

Length to 5½ inches.

Distinguished by the somewhat elongate first spine in the spinous dorsal fin reaching the middle of the rayed fin when depressed, the second spine not reaching this point, the two short rows of scales on the upper part of the body extending slightly behind the origin of the rayed dorsal fin and the presence of two moderate flattened supraocular cirri.

The lesser filamented sculpin was first taken in British Columbia waters June 20, 1903, in the strait of Georgia off Bowen island, when two small specimens were obtained by the *Albatross*, station 4193, lat. 49° 20′ N., long. 123° 43′ W., depth 23 fathoms and recorded in 1907 by B. W. Evermann and E. L. Goldsborough as *Tarandichthys tenuis* (Gilbert). Other individuals have been obtained from False narrows, near Nanaimo, northward to Tasu harbour in the Queen Charlotte islands. The depth range recorded from British Columbia waters is 20 to 70 fathoms, but in California it is from 18 to 204 fathoms. The food consists in part of shrimps.

Range southern California to Queen Charlotte islands.

Filamented sculpin *Icelinus filamentosus* Gilbert 1890

Body elongate, moderately slender. Head moderate; mouth terminal, moderate; snout bluntly rounded; spines: nasal small, sharp; preopercular, 4, uppermost stout, antler-like, with 3 or 4 upwardly directed spinules; gill membranes united, free from isthmus. Anus two-thirds distance between insertion of pelvic fins and origin of anal fin. Anal papilla short, stout, conical. Fins: dorsal (2), IX to XI—15 to 18, first two spines elongate, filamentous, reaching middle or beyond of rayed fin; anal, 13 to 15; pelvic, I, 2, thoracic; caudal, truncate to rounded. Lateral line: sharply decurved, then straight. Scales: ctenoid; on upper part of body in two rows close to dorsal fins, beginning below third or fourth spine, ending below last ray, in each row, 28 to 31; on lateral line, 36 to 39, rough. Cirri: along lateral line in short series, small, filamentous; on head, nasal, 1, supraocular, 1, large, flattened, multifid, between supraocular and origin of spinous dorsal fin, 2, on posterior tip of maxillary, 1, on cheek, 1, on preopercle, 3. Colour: olive green to light brown on dorsal surface; creamy yellow to light brown on ventral surface; dark saddles across body, 4, one below spinous dorsal fin, two below rayed dorsal fin, one at base of caudal fin; jet black on supraocular cirri;

barred with rows of black blotches on all fins except pelvics and anal; dusky along margin of anal fin; males sometimes variously blotched with orange to red.

Length to 10¼ inches.

Distinguished by the first two very elongate spines in the spinous dorsal fin reaching at least to the middle of the rayed dorsal fin when depressed, the two rows of scales on the upper part of the body reaching merely to the posterior end of the rayed dorsal fin and the presence of two large flattened supraocular cirri.

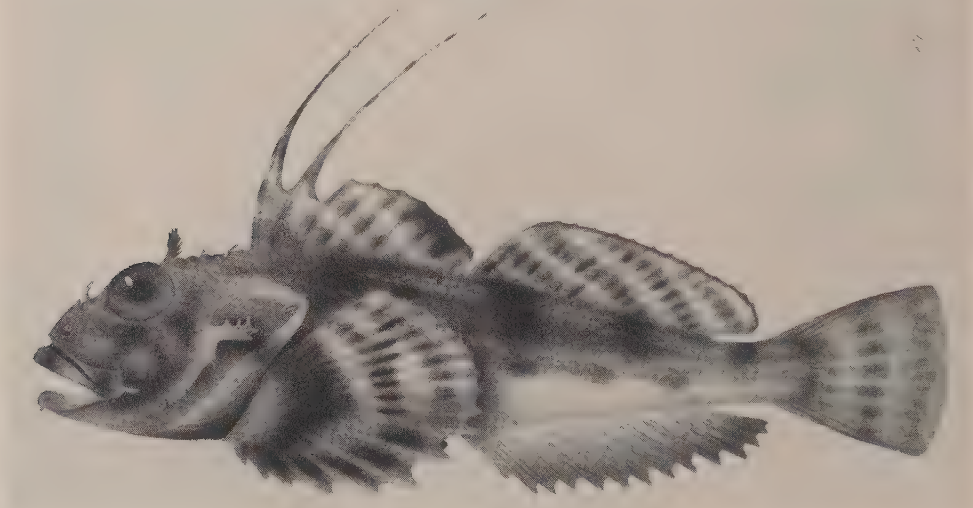

FIGURE 181. Filamented sculpin. *Icelinus filamentosus* Gilbert 1890

The filamented sculpin was first taken in British Columbia waters June 20, 1903, in the strait of Georgia off Bowen island by the *Albatross*, station 4193, lat. 49° 20′ N., long. 123° 43′ W., depth 23 fathoms. This specimen was 2½ inches in length and was recorded in 1907 by B. W. Evermann and E. L. Goldsborough as *Tarandichthys filamentosus* (Gilbert). Single individuals have since been obtained: in 1928, near Porlier pass, at 25 to 30 fathoms; in 1934, at Active pass, depth 40 fathoms; in 1934, in Burrard inlet, depth 10 to 20 fathoms; also in 1934, from southwest of Esteban point on the west coast of Vancouver island, depth 60 fathoms; in 1941, from the strait of Georgia at approximately 40 fathoms. The food consists of a varied diet of crustaceans, including shrimps and isopods.

Range southern California to southeastern Alaska.

Cabezon *Leptocottus armatus* Girard 1854

Body elongate, moderately stout anteriorly. Head depressed, moderately broad; mouth terminal, large; lower jaw included; snout bluntly rounded; spines:

nasal, absent; preopercular, 3, uppermost large antler-like, spinules, 4, three prominent, one minute, lower two spines small; gill membranes united, broadly joined to isthmus. Anus immediately in front of anal fin. Anal papilla small, conical. Fins: dorsal (2), VI to VIII—15 to 20; anal, 15 to 20; pelvic, I, 4, thoracic; caudal, truncate. Lateral line: almost straight. Scales: absent. Pores: on lateral line, 37 to 42. Cirri: absent. Colour: grayish olive to green with some yellow on dorsal surface; orange yellow to white on ventral surface; creamy yellow with green or black bars on all fins except pelvic and anal; orange on margin with large black spot on posterior portion of spinous dorsal fin.

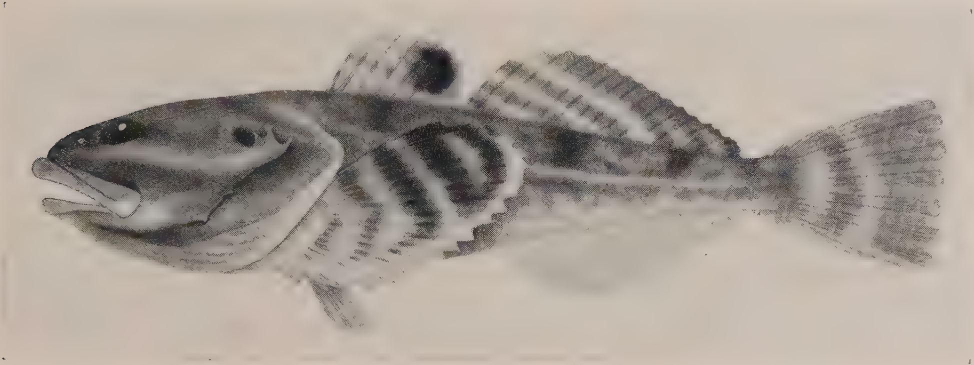

FIGURE 182. Cabezon. *Leptocottus armatus* Girard 1854

Length to 12 inches.

Distinguished by the scaleless body, the prominent antler-like uppermost preopercular spine on each side of the head, the grayish olive to green coloration with the yellow and black markings and the conspicuous black spot on the posterior portion of the spinous dorsal fin.

The cabezon was first taken in British Columbia waters by H.M.S. *Plumper* near Vancouver island and was recorded in 1860 by A. Günther as *Centridermichthys armatus*. In June, 1882, it was collected near Port Simpson by Capt. H. E. Nichols and recorded in 1883 by T. H. Bean as *Leptocottus armatus* Girard. In 1901 it was listed as from the Queen Charlotte islands by W. H. Osgood as *Leptocottus maculosus*. (evidently an error for *armatus*). The species is very abundant along the whole coast in shallow water. It is to be found frequently in tide-pools and will expand its gill covers and erect its preopercular spines when disturbed. The juvenile sportsman takes it on a hand-line using a marine worm for bait and occasionally on a trout spinner. The food consists of a countless variety of invertebrates. The cabezon is eaten to a considerable extent by waterfowl, especially ducks.

Range southern California to northwestern Alaska.

Buffalo sculpin *Enophrys bison* (Girard) 1854

Body elongate, very stout anteriorly. Head large, broad; mouth terminal, moderate; snout blunt; occipital ridges, 2, prominent; spines: nasal, broad, rough; preopercular, 4, uppermost greatly elongate, simple, sharp, rough tuberculate at base anteriorly, lower three much smaller, two pointing backward, one downward; preopercular, 3, uppermost greatly elongate, length two or three times diameter of eye, sharp, rough tuberculate; gill membranes united, broadly joined to isthmus, without free fold posteriorly. Anus immediately in front of anal fin. Anal papilla small, rounded. Fins: dorsal (2), VII to IX—9 to 12; anal, 8 to 10; pelvic, I, 3, thoracic; caudal, truncate to rounded. Lateral line: high, following dorsal contour. Scales: in form of large rough raised tuberculate plates; absent from body above and below lateral line; on lateral line, 29 to 33; on head, numerous, irregular. Cirri: absent. Colour: dark green to brown on dorsal surface; yellow to white on ventral surface; black saddles across body, 3, broad; yellowish white on bands across back and sides, on pectoral fins and at base of caudal fin; colours various on slender bands across all fins except pelvics.

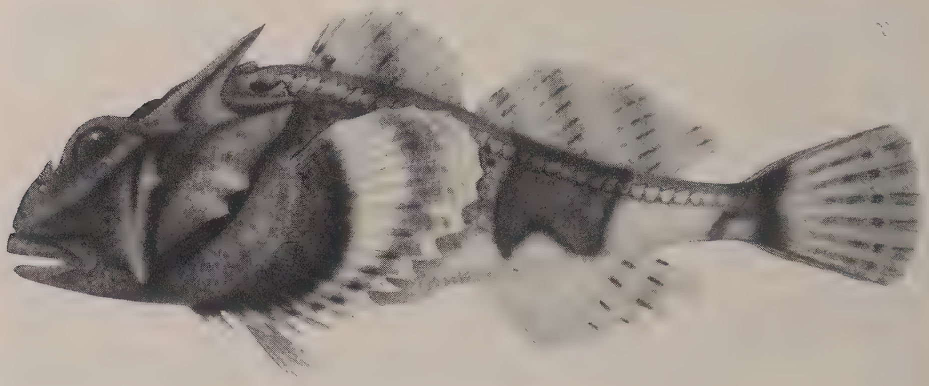

FIGURE 183. Buffalo sculpin. *Enophrys bison* (Girard) 1854

Length to 12 inches.

Distinguished by the very long rough uppermost preopercular spines, the gill membranes joined to the isthmus without a free posterior fold and the large raised tuberculate plates on the high lateral lines.

The buffalo sculpin was first taken in British Columbia waters in May, 1882, at Esquimalt by Capt. H. E. Nichols and recorded in 1883 by T. H. Bean as *Aspidocottus bison* Girard. It was listed in 1901 by W. H. Osgood from the Queen Charlotte islands as *Euophrys bison* (evidently a misprint for *Enophrys*). The species is very common along the whole coast and is found frequently in shallow water where it feeds upon shrimps, crabs, amphipods, mussels, small fishes such as herring, young salmon, sea-perches and sand-lances as well as upon considerable quantities of sea-lettuce, *Ulva*. The buffalo sculpin spawns in February and March and the orange brown eggs are laid in small clusters. When disturbed it expands the preopercles so that the spines are greatly elevated thus presenting a formidable appearance. This fish will take a bait readily and provides sport for the juveniles, who frequently suffer hand wounds from the jagged spines.

Range southern California to northwestern Alaska.

Great sculpin *Myoxocephalus polyacanthocephalus* (Pallas) 1811

Body elongate, stout anteriorly. Head large, depressed, broad; mouth terminal, large; snout bluntly rounded; cranial ridges and spines numerous, low; spines: nasal, short, blunt; preopercular, 3, uppermost long, equal to diameter of eye, straight, usually simple, sometimes bifid at tip, lowermost pointing downward, usually covered with skin; gill membranes united, free from isthmus. Anus slightly in advance of anal fin. Anal papilla small, rounded. Fins: dorsal (2), IX or X—13 to 16; anal, 11 to 13; pelvic, I, 3, thoracic; pectoral, broad, procurrent; caudal, truncate. Lateral line: high, following dorsal contour. Scales: reduced ctenoic in form of small plates embedded in fleshy papillae, each usually with small embedded or projecting spine; on body scattered; on head numerous, small, rounded, especially behind eye. Pores on lateral line: about 35. Cirri: absent. Colour: dark olive to black on dorsal surface; white to cream on ventral surface; creamy white bands across body, 2; black mottling or barring on all fins except pelvics.

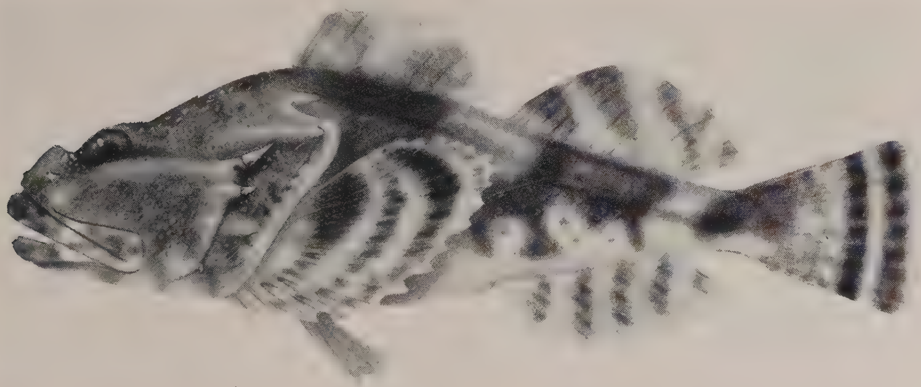

FIGURE 184. Great sculpin. *Myoxocephalus polyacanthocephalus* (Pallas) 1811

Length to 2 feet 6 inches.

Distinguished by the stout body with scattered small papillae, the long straight uppermost preopercular spine on each side of the head and the large head covered with small rounded papillae.

The great sculpin was first recorded from British Columbia waters in 1866 by J. K. Lord as *Cottus polyacanthocephalus*, without definite locality or date of capture stated. The first specific record is that of two specimens taken in 1880 at Victoria from the stomach of a big skate, *Raja binoculata*, and recorded in the same year by D. S. Jordan and C. H. Gilbert as *Cottus polyacanthocephalus* Pallas. The species is common along the whole coast at moderate depths. The food consists to some extent of small fishes such as sculpins and blennies.

Range Puget sound to northwestern Alaska.

Long-finned sculpin *Jordania zonope* Starks 1895

Body elongate, slender. Head moderate; mouth terminal, small; snout blunt; spines: nasal, long, sharp, recurved; preopercular, 2, lower well developed, upcurved; gill membranes united, free from isthmus. Anus immediately in front of anal fin. Anal papilla small, conical. Skin: in plate-like folds extending obliquely from lateral line to within short distance of base of anal fin. Fins: dorsal (2), XVII or XVIII—15 to 17; anal, 22 to 24, origin below posterior third of spinous dorsal; pelvic, I, 5, thoracic; caudal, rounded. Lateral line: slightly decurved, then straight. Scales: strongly ctenoid, covering body above lateral line; on lateral line, 48 to 50; on posterior margins of skin folds below lateral line, small, finely, sharply serrate. Cirri: nasal, 2, one large, one small; supraocular, 2, large, plumose, posterior larger; frontoparietal, 3, moderate. Colour: olive green, spotted with red; dark cross saddles on dorsal surface of body, 6 or 7; dark bands across dorsal, pectoral and caudal fins, narrow; black on snout and upper lip; chocolate brown bars radiating downward from eye, 2.

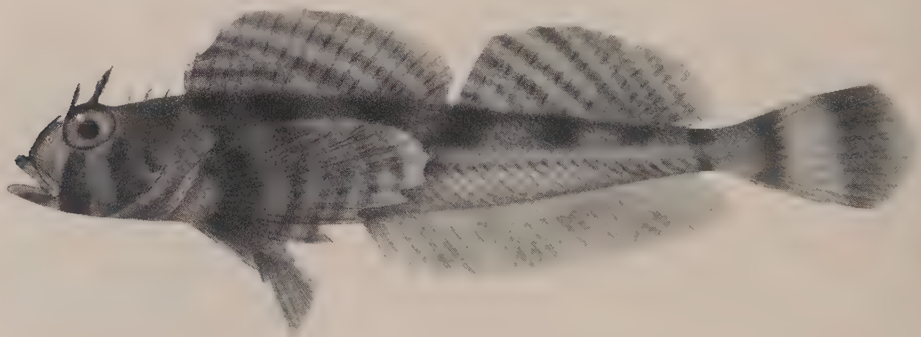

FIGURE 185. Long-finned sculpin. *Jordania zonope* Starks 1895

Length to 4 inches.

Distinguished by the slender body, the long spinous dorsal fin, the plate-like folds of skin below the lateral line, the scales completely covering the body above the lateral line and on the posterior margins of the folds of skin below the lateral line and the pelvic fins each with 1 spine and 5 rays.

The long-finned sculpin has so far been represented by a single specimen from British Columbia waters, taken in June, 1909, near Ucluelet, Vancouver island, by Messrs. C. H. Young and W. Spreadborough and recorded in 1920 by B. A. Bean and A. C. Weed.

Range northern California to Barkley sound.

Rough-spined sculpin *Prionistius macellus* Bean 1883

Body elongate, very slender, tapering to very slender caudal peduncle; lower profile nearly straight. Head elongate, somewhat depressed; mouth terminal, moderate; snout moderately long, rounded; spines: nasal, short, sharp; preopercular, 2, upper sharp, lower blunt; gill membranes united, free from isthmus. Anus about midway between insertion of pelvic fins and origin of anal fin. Anal papilla elongate, conical, constricted at tip. Skin: in series of oblique folds along each side of body below lateral line. Fins: dorsal (2), XI—28 or 29; anal, 28 or 29, origin below that of rayed dorsal; pelvic, I, 3, thoracic; pectoral, 15 to 17, lower 5 to 7 rays greatly exserted; caudal, emarginate. Lateral line: high, slightly decurved below spinous dorsal fin, then straight. Scales: ctenoid; covering body above lateral line, very small; no row of enlarged scales near bases of dorsal fins; on lateral line, 50 to 53, moderately large, without keels, forming rough ridge; below lateral line, on posterior margins of oblique folds of skin, minute; on top of head, dense, minute; on eyeball, in row across upper part; on spines and rays of all fins in form of minute prickles. Cirri: absent. Colour: olive green to light brown on dorsal surface; cream on ventral surface; dark saddles across body, 5; jet black spot on each side of snout near tip; fins translucent, barred with brown on rayed dorsal, pectoral and caudal fins, faint on rayed dorsal fin; jet black spot on tip of membrane between first and second spines of spinous dorsal fin.

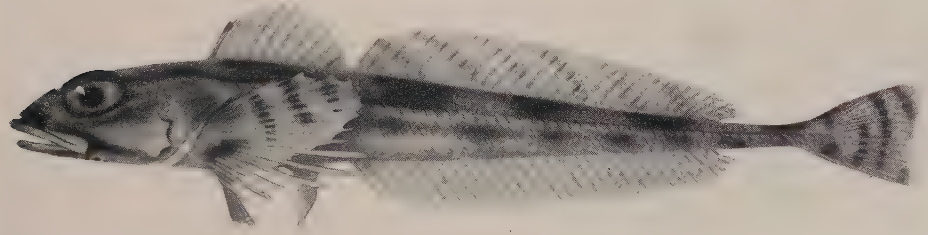

FIGURE 186. Rough-spined sculpin. *Prionistius macellus* Bean 1883

Length to 8 inches.

Distinguished by the slender body, the oblique folds of skin on each side of the body below each lateral line margined with minute scales, the greatly exserted lower rays in the pectoral fin, the absence of a row of large scales from each side of the body near the bases of the dorsal fins and the row of scales across each eyeball.

The rough-spined sculpin was first taken in British Columbia waters in August, 1882, in Carter bay by Capt. H. E. Nichols. This was described in 1883 as the type of a new genus and species by T. H. Bean and was deposited in the United States National Museum. A second individual was obtained in the following year in the same locality. Additional specimens have been secured in Burrard inlet, English bay and Howe sound in shrimp trawls at depths ranging from 10 to 50 fathoms, as well as one from Safety cove and one from near Prince Rupert.

Range Puget sound to northwestern Alaska.

Ribbed sculpin *Triglops beani* Gilbert 1895

Body elongate, stout anteriorly, tapering to slender caudal peduncle; dorsal surface highly arched; lower profile nearly straight. Head elongate, depressed; mouth terminal, moderate; snout long, pointed; spines: nasal, short, sharp to blunt; frontal, 2, blunt; preopercular, 4, upper two sharp; gill membranes united, free from isthmus. Anus midway between insertion of pelvic fins and origin of anal fin. Anal papilla elongate, conical. Skin: in series of oblique folds along body below lateral line. Fins: dorsal (2), X or XI—23 to 26; anal, 23 to 26, origin below that of rayed dorsal; pelvic, I, 3, thoracic; pectoral, 17 or 18, not thickened, not exserted; caudal, truncate. Lateral line: high, decurved below spinous dorsal fin, then straight. Scales: ctenoid: above lateral line and on head numerous, small, of various sizes and shapes; in row near bases of dorsal fins commencing above preopercle, extending to point below middle of rayed fin,

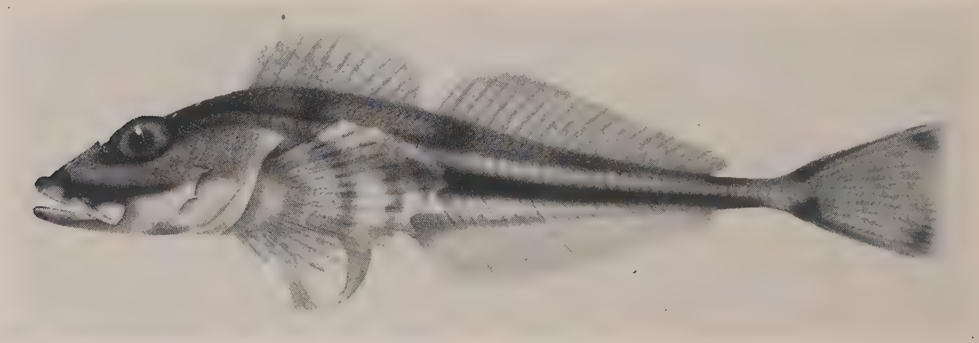

FIGURE 187. Ribbed sculpin. *Triglops beani* Gilbert 1895

moderately large, upright, spines large; on lateral line, 49 or 50, large, without keels, forming rough ridge; below lateral line on posterior margins of oblique folds of skin, represented by minute prickles; across eyeball in 3 rows; on spines and rays of all fins, in form of minute prickles. Cirri: absent. Colour: light olive brown on dorsal surface; white on ventral surface; dark saddles across body, 5; in male, narrow black stripe along body below lateral line, separated therefrom by narrow silvery streak; in female, stripe represented by disconnected series of irregular dark areas.

Length to 8 inches.

Distinguished by the slender tapering body, the slender caudal peduncle, the oblique folds of skin below the lateral line on each side of the body margined with minute prickles, the row of enlarged scales near the bases of the dorsal fins and the three rows of scales across each eyeball.

The ribbed sculpin was first taken in British Columbia waters September 4, 1891, near Victoria, by the *Albatross*, station 3465, lat. 48° 21′ N., long. 123° 14′ W., depth 48 fathoms and recorded in 1895 by C. H. Gilbert. A second specimen was obtained in 1908 near Esquimalt and is now in the Provincial Museum at Victoria.

Range Puget sound to northwestern Alaska.

Darter sculpin *Radulinus asprellus* Gilbert 1890

Body elongate, very slender, dorsal surface flattened, forming prominent ridge with lateral surface. Head elongate, somewhat depressed; mouth terminal, small; snout bluntly rounded; eye large; spines: nasal long, strong; preopercular, 2, short, simple, sharp; gill membranes united, free from isthmus. Anus two-thirds distance between insertion of pelvic fins and origin of anal fin. Anal papilla very elongate, slender. Fins: dorsal (2), VIII to XI—20 to 23, close together; anal, 22 to 25, origin below that of rayed dorsal; pelvic, I, 3, thoracic; pectoral barely reaching origin of anal in male, slightly shorter in female, lower rays not thickened, slightly exserted; caudal, rounded. Lateral line: high,

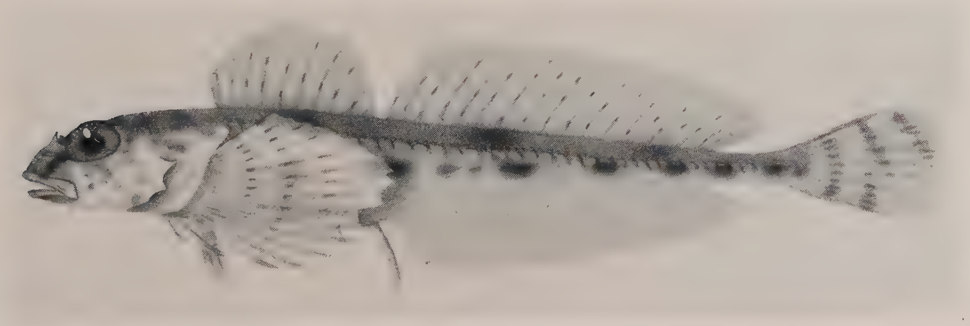

FIGURE 188. Darter sculpin. *Radulinus asprellus* Gilbert 1890

almost straight, following conspicuous dorsolateral ridge of body. Scales: strongly ctenoid; small, in single row commencing in median position on posterior area of interorbital space, passing around posterior margin of eye, thence backward above and contiguous with lateral line, extending to point below middle of rayed dorsal fin; on lateral line, 38 to 41, large, keeled, spinous; absent from occipital area. Cirri: absent. Tubercles: in row across upper margin of eyeball, minute. Colour: light brown to gray on dorsal surface; lighter brown to creamy white on ventral surface; dark saddles and blotches across back, 3 or 4, faint; brownish black streak downward and forward in front of eye; fins translucent without colour except for fine red dots on spines and rays of dorsal, anal and pectoral fins.

Length to 6 inches.

Distinguished by the very slender angular body, the absence of scales from the top of the head, the long nasal spines, the high lateral line with very spinous keeled scales and the row of small scales contiguous with the lateral line extending onto the head.

The darter sculpin was first taken in British Columbia waters June 19, 1903, near Nanaimo by the *Albatross*, station 4191, lat. 49° 11′ N., long. 123° 54′ W., depth 54 fathoms and recorded in 1907 by B. W. Evermann and E. L. Goldsborough. The species is fairly common in the strait of Georgia and Burrard inlet at moderate depths and is caught frequently in shrimp trawls. Specimens have been obtained off the west coast of Vancouver island in the Nootka area in 1934 by the *Wm. J. Stewart*, near Fort Rupert in 1903 by the *Albatross*, station 4204, and in 1935 near Graham island by the *Wm. J. Stewart;* the depth range in the above areas was 10 to 70 fathoms. In southern California waters individuals have been recorded from depths as great as 155 fathoms.

Range southern California to northwestern Alaska.

Taylor's sculpin *Asemichthys talori* Gilbert 1912

Body elongate, moderately stout; dorsal surface slightly arched. Head elongate, moderately deep; mouth terminal, small; snout bluntly rounded; eye large; spines: nasal long, strong; preopercular, 3, upper two short, flat, triangular, lowermost minute, all spines covered with skin; gill membranes broadly united, free from isthmus. Anus two-thirds distance between insertion of pelvic fins and origin of anal fin. Anal papilla elongate, conical. Fins: dorsal (2), X or XI—15 or 16; anal, 15 to 17, origin below that of rayed dorsal; pelvic, I, 3, thoracic; pectoral, reaching third or fourth ray of anal fin, lower 10 or 11 rays thickened, slightly exserted; caudal, rounded. Lateral line: high, slightly arched, then straight. Scales: ctenoid; above lateral line in single row or in 4 rows, lowermost contiguous with lateral line; on lateral line, 34 to 36, in form of spinous plates with slight keels forming rough ridge; on occipital area, numerous, small, forming ill-defined row toward row above lateral line. Cirri: below lateral line in row, slender, filamentous; on posterior margin of orbital rim, 1, short. Tubercles: in row on anterior and upper margin of eyeball, minute. Colour: olive brown on dorsal surface; lighter on ventral surface; dark saddles across body, 4; dark bars on dorsal, pectoral and caudal fins; unmarked on pelvic and anal fins.

Length to 2¼ inches.

Distinguished by the moderately stout body, the presence of scales on the top of the head, the long nasal spines, the high lateral line of slightly keeled spinous scales, the 1 or 4 rows of scales immediately above and contiguous with the lateral line and the long pectoral fins.

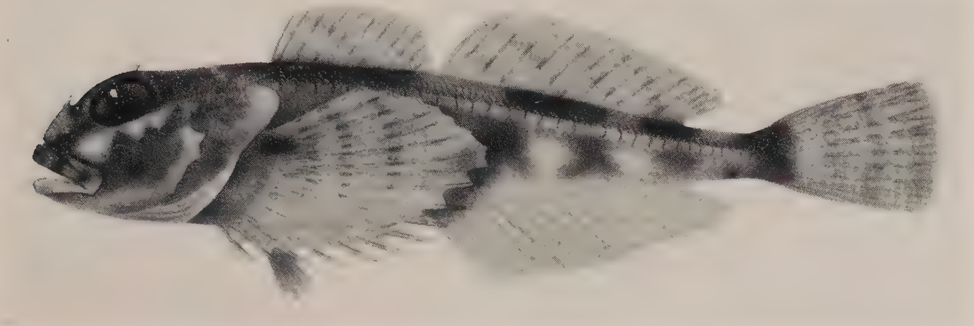

FIGURE 189. Taylor's sculpin. *Asemichthys taylori* Gilbert 1912

Taylor's sculpin is represented by three known specimens. The type, a female, was taken some time prior to 1910 in Departure bay by the Rev. G. W. Taylor, first director of the Pacific Biological Station. It was described in 1912 by C. H. Gilbert as a new genus and species and is now lodged in the museum of Stanford University. The second specimen, a male, was secured January 4, 1934, in Burrard inlet in a shrimp trawl at a depth of 20 fathoms and is now in the collection of the University of British Columbia. The third, also a male, was obtained June 27, 1935, in Tasu harbour, Queen Charlotte islands, in a dredge at a depth of 7 to 25 fathoms by the *Wm. J. Stewart* expedition and is in the collection at the Pacific Biological Station, Nanaimo.

Range strait of Georgia to the Queen Charlotte islands.

Manacled sculpin *Synchirus gilli* Bean 1889

Body elongate, slender. Head elongate; mouth terminal, small; lower jaw included; snout sharply pointed; eye large; spines: nasal, stout, sharp; preopercular, 1, sharp, widely bifid; gill membranes united, free from isthmus. Anus one-quarter distance between insertion of pelvic fins and origin of anal fin. Anal papilla large, cylindrical, constricted to slender filamentous tip, between two lateral inwardly curved processes, cylindrical portion in groove between anus and anal fin. Fins: dorsal (2) VIII to XI—19 to 21; anal, 18 to 20; pelvic, I, 3, thoracic, long, tips of fins expanded, bent inward, used as holdfasts; pectoral large, completely united anteriorly and ventrally, rays curved inward; caudal, rounded. Lateral line: slightly wavy. Scales: ctenoid; in row near bases of dorsal fins; on lateral line, 38 to 40. Cirri: postocular, 1, small. Colour: green to yellowish brown on dorsal surface; paler on ventral surface; light blotches across back, about 7; coloration extremely variable depending upon habitat. Membranes of all fins transparent, black pigment sparse, minute, confined to rays of rayed dorsal, pectoral, anal and caudal fins.

Length to 2 inches.

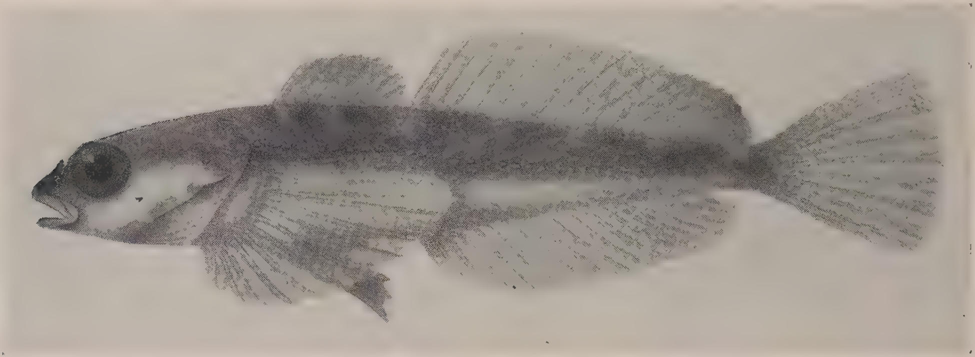

FIGURE 190. Manacled sculpin. *Synchirus gilli* Bean 1889

Distinguished by the united pectoral fins.

The manacled sculpin was first taken September 27, 1888, in Barkley sound by the *Albatross*. Three specimens from 1½ to 1¾ inches in length were obtained, one of which was selected as the type of the genus and species, recorded as such in 1889 by T. H. Bean and deposited in the United States National Museum. Since that time individuals have been obtained in Departure bay, and at Gabriola island in Taylor bay. The manacled sculpin inhabits the shallow waters of bays and tide-pools and is also found around wharf piles and rocks clinging to barnacles by means of its pectoral and pelvic fins.

Range Puget sound to Vancouver island.

Sailor-fish *Nautichthys oculo-fasciatus* (Girard) 1857

Body elongate, slender, compressed, anteriorly rising abruptly above head. Head compressed; mouth terminal, moderate; lower jaw slightly included; snout blunt; eye large, very high; interorbital space depressed; occiput depressed, rough; cranial ridges: bluntly spinous; spines: nasal, large, sharp; preopercular, 2, small, sharp; gill membranes united, broadly joined to isthmus. Anus about half distance between insertion of pelvic fins and origin of anal fin. Anal papilla bulbous, rounded, ending in long slender filament. Fins: dorsal (2), VIII or IX—27 to 30, spinous fin very high, first five spines very elongate, remaining four or five diminishing rapidly, rayed fin very long, moderately high; anal, 18 to 20, long, low; pelvic, I, 3, thoracic, moderately long, spine short, slender; pectoral, 13 or 14, long, placed low; caudal, obliquely rounded, asymmetrical, lower rays longer than upper. Lateral line: slightly decurved, then straight. Scales: reduced ctenoid, in form of small slender spines; everywhere on body and head; on rayed dorsal and caudal fins to tips; on bases of pectoral and anal fins; on lateral line, large, in form of long stout bifid spines, preceding each pore. Pores on lateral line: 41 to 45. Cirri: on nasal spines; on eyeball above pupil, 4, first large, multifid, plumose, followed by three small, filamentous; on maxillary, small, weakly multifid. Colour: light brown to dark gray on dorsal surface; very light brown to cream on ventral surface; black blotches across body, 5; black spots in series along lateral line; jet black band on supraorbital cirrus, downward through eye across cheek, conspicuous; barred with green on dorsal fins, sometimes flecked with light brick red on rayed dorsal fin; heavily barred with black on base of pectoral fins, on posterior of anal and caudal fins.

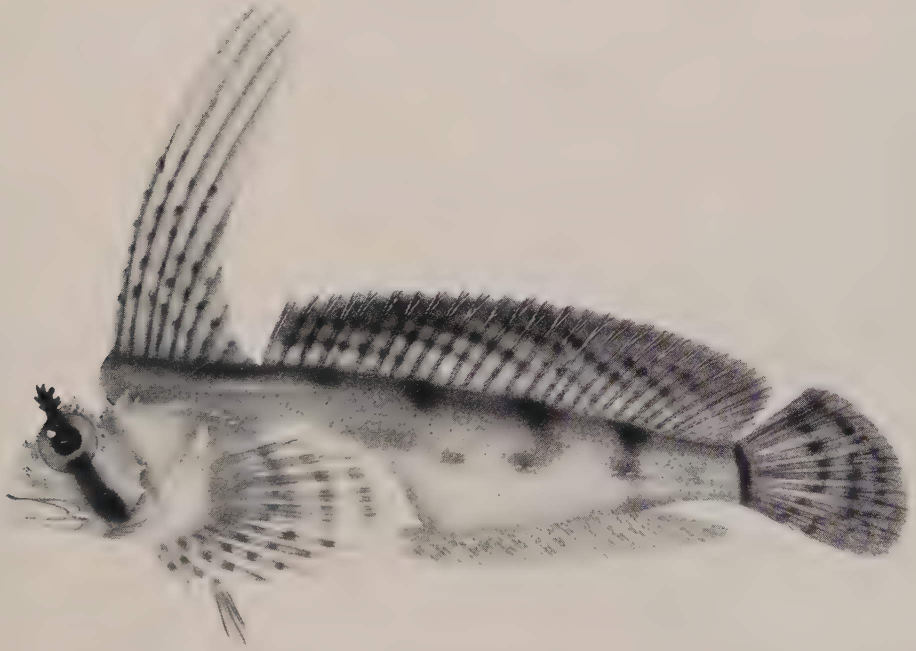

FIGURE 191. Sailor-fish. *Nautichthys oculo-fasciatus* (Girard) 1857

Length to 8 inches.

Distinguished by the high spinous dorsal fin, the large plumose cirrus on each eyeball, the black band downward through each eye and across the cheek, the depressed occiput and the asymmetrically rounded caudal fin.

The sailor-fish was first taken in British Columbia waters September 4, 1891, east of Victoria, by the *Albatross*, station 3465, lat. 48° 21′ N., long. 123° 14′ W., depth 48 fathoms and was recorded in 1895 by C. H. Gilbert. The species is often obtained in Burrard inlet in shrimp trawls and has been reported from Victoria, Sydney, Ucluelet, Departure bay and Jervis and Rivers inlets. This fish is a sluggish inhabitant of the shore waters but is known to range to a depth of at least 50 fathoms. The food consists in part of crustaceans.

Range northern California to northwestern Alaska.

Prickly sculpin *Oligocottus rimensis* (Greeley) 1901

Body elongate, slender. Head moderate, front profile very steep; mouth terminal, moderate; snout bluntly rounded; spines: nasal, small, sharp; preopercular, 1, small, simple, curved upward; gill membranes united, free from isthmus. Anus immediately in front of anal fin. Anal papilla small, slender, usually curved forward. Skin: thick, firm. Fins: dorsal (2), VIII to X—16 to 19; anal, 13 to 15, origin below posterior end of spinous dorsal fin (in male, first two rays greatly enlarged, subequal, membranes deeply incised); pelvic, I, 3, thoracic; pectoral, very large; caudal, rounded. Lateral line: high anteriorly, decurved, then straight. Scales: reduced ctenoid, in form of minute plates, each with long slender spine; everywhere on body, minute, weak; on head, scattered, smaller. Pores: on lateral line, 35 to 41. Cirri: long, filamentous, in row along anterior half of lateral line; on head, sparse, scattered. Colour: light olive green or reddish brown on dorsal surface; creamy white to pale green on ventral surface; dark blotches across body, 5, irregular, bordered by light blue; faintly barred with green or reddish brown on rayed dorsal, pectoral and caudal fins. In young, colours often much brighter.

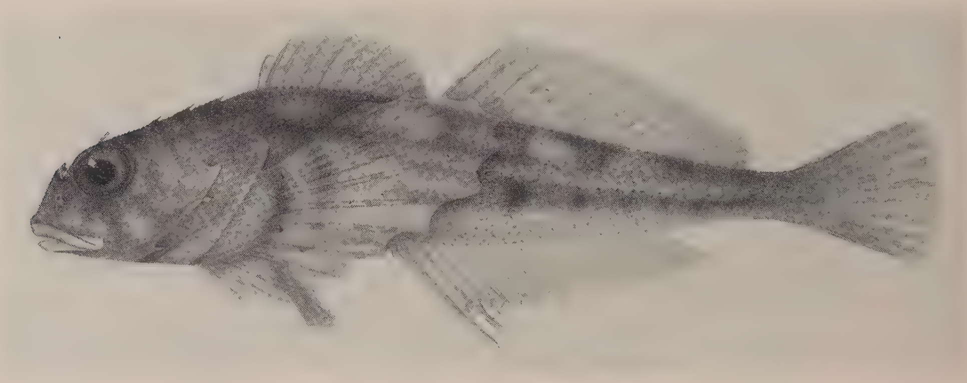

FIGURE 192. Prickly sculpin. *Oligottus rimensis* (Greeley) 1901

Length to 2 inches.

Distinguished by the almost vertical profile of the snout, the single upcurved preopercular spine on each side of the head, the minute scales in form of prickles and the anus immediately in front of the anal fin below the spinous dorsal fin.

The prickly sculpin was first taken in British Columbia waters July 27, 1926, at Gabriola island in Taylor bay, by Professor J. R. Dymond and was recorded in 1928 by C. L Hubbs as *Rusciculus rimensis* Greeley. This individual is now in the Royal Ontario Museum of Zoology at Toronto. On July 29, 1930, a second specimen was obtained in Barkley sound by Dr. V. E. Shelford in a tide-pool, recorded in the same year by L. P. Schultz as *Rusciculus rimensis* Greeley. On August 24, 1942, three males were secured by Dr. G. C. Carl and the second author at Victoria on Gonzales point in a tide-pool at extreme low tide. The species is one of the smallest of the tide-pool forms.

Range northern California to Vancouver island.

Tide-pool sculpin *Oligocottus maculosus* Girard 1856

Body elongate, moderately stout, slightly compressed. Head conical; mouth terminal, small; snout bluntly rounded; spines: nasal, stout, blunt; preopercular, 1, small, bifid, one spinule pointing upward, other backward; gill membranes united, free from isthmus. Anus immediately in front of anal fin. Anal papilla long, slender, usually curved forward. Skin: thick, smooth, firm. Fins: dorsal (2), VIII or IX—16 to 18; anal, 12 to 14, origin below posterior third of spinous dorsal fin (in male, first 3 or 4 rays longest, stoutest, membranes deeply incised; in female, first ray very short); pelvic, I, 3, thoracic; pectoral large, lower rays somewhat exserted; caudal, rounded. Lateral line: high anteriorly, decurved, then straight. Scales; absent. Pores: on lateral line, 34 to 39. Cirri: single or paired, filamentous; along lateral line anteriorly for about distance of fifteen pores; on head, numerous; in breeding male, on tips of dorsal fin spines, fleshy.

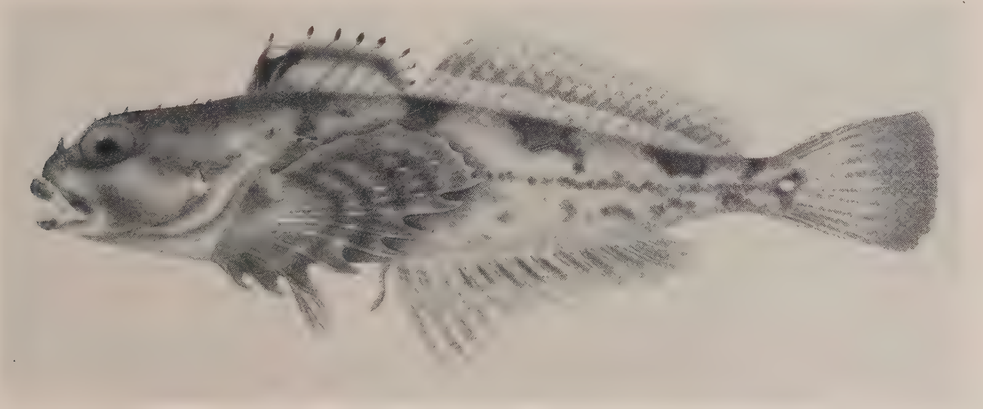

FIGURE 193. Tide-pool sculpin. *Oligocottus maculosus* Girard 1856

Colour: reddish brown, green or crimson on dorsal surface, according to surroundings; white to cream, diffused with green or blue, on ventral surface; dark blotches across body, 5, irregular; white spot at base of caudal fin, prominent; variously mottled and barred on rayed dorsal, pectoral and caudal fins. In male, small orange spot on anterior membranes of spinous dorsal fin margined below by jet black which becomes broader and less intense posteriorly.

Length to 3½ inches.

Distinguished by the forked preopercular spine on each side of the head, the filamentous cirri on the head and on the anterior portion of each lateral line, the anus immediately in front of the anal fin and below the rayed dorsal fin and the 3 or 4 stout rays in the anal fin of the male.

The tide-pool sculpin was first taken in British Columbia waters at Vancouver island by H.M.S. *Plumper* and recorded in 3860 by A. Günther as *Centridermichthys maculosus*. An individual captured in 1893 at Comox by Mr. J. Macoun was recorded in 1920 by B. A. Bean and A. C. Weed as *Oligocottus borealis* Jordan and Snyder. The species is exceedingly abundant in the shallow waters, especially in tide-pools around rocky shores, where it darts from one protective spot to another with great speed. Spawning was observed February 17, 1942, in the Vancouver Aquarium. The male clasped the female with one pectoral fin and fertilized the pale greenish blue eggs as they were deposited on a rock.

Range northern California to northwestern Alaska.

Fluffy sculpin *Oligocottus snyderi* Greeley 1901

Body elongate, moderately stout, slightly compressed. Head conical; mouth terminal, small; snout pointed; spines: nasal, stout, blunt; preopercular, 1, small, bifid, one spinule pointing upward, other backward; gill membranes united, free from isthmus. Anus immediately in front of anal fin. Anal papilla long, slender, conical. Skin: thick, smooth, firm. Fins: dorsal (2), VII to IX—17

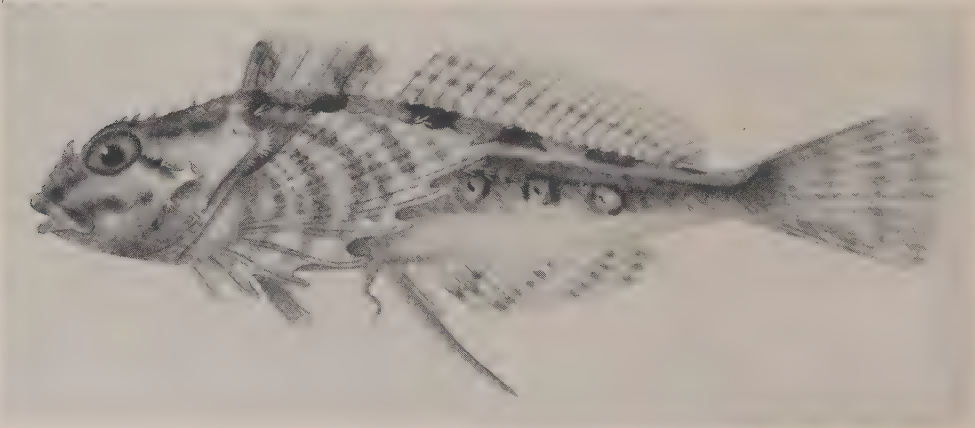

FIGURE 194. Fluffy sculpin. *Oligocottus snyderi* Greeley 1901

to 19; anal, 12 to 15, origin below posterior third of spinous dorsal fin (in male, first ray long, stout, second not enlarged, separated from remainder of fin; in female, membranes between first 3 or 4 rays deeply incised); pelvic, I, 3, thoracic; pectoral large, lower rays exserted; caudal, rounded. Lateral line: high anteriorly, gradually decurved, then straight. Scales: absent. Pores: on lateral line, 36 to 39. Cirri: very numerous, filamentous, usually in groups of 3 or 4; in row along bases of dorsal fins from third spine in spinous fin to sixteenth or seventeenth ray in rayed fin; in row along anterior two-thirds of lateral line; between these two rows, short row extending from under last two spines in spinous dorsal fin to beneath third or fourth ray in rayed fin; on head in groups of 3 or 4, joined at bases; on spinous dorsal fin, single, immediately behind tip of each spine. Colour: green to light reddish brown but frequently pink or lavender; dark blotches across body, 5 or 6, irregular; dark brown circles along lateral line, 5; white spots on body numerous, small; dusky blotches on spinous dorsal fin, 2, anterior and posterior; lightly barred with dusky dots on rayed dorsal, pectoral, anal and caudal fins.

Length to 3¼ inches.

Distinguished by the forked preopercular spine on each side of the head, the 3 rows of cirri in groups along each side of the body, the anus immediately in front of the anal fin and the long stout ray in the anal fin of the male.

The fluffy sculpin was first taken in British Columbia waters in June or July, 1909, by W. Spreadborough at Ucluelet and recorded in 1920 by B. A. Bean and A. C. Weed as *Dialarchus snyderi* (Greeley). The species has been collected from Vargas island to Kyuquot on the west coast of Vancouver island and from Skidegate inlet in the Queen Charlotte islands. This is one of the small colourful tide-pool sculpins.

Range southern California to Queen Charlotte islands.

Globe-headed sculpin *Clinocottus globiceps* (Girard) 1857

Body elongate, moderately stout. Head blunt, anterior profile rounded; mouth terminal, small; lower jaw included; lips thick; snout very blunt; spines: nasal, blunt; preopercular, 1, small, blunt, covered with skin; gill membranes united, free from isthmus. Anus two-thirds distance from insertion of pelvic fins to origin of anal fin. Anal papilla stout, conical, usually curved forward. Skin: thick, smooth. Fins: dorsal (2), IX or X—15 to 17; anal, 10 to 12, membranes greatly incised, origin below anterior third of rayed dorsal fin; pelvic, I, 3, thoracic; pectoral, large; caudal, rounded. Lateral line: high anteriorly, decurved, then straight. Scales: absent. Pores: on lateral line, 34 to 40. Cirri: multifid; in row along anterior half of lateral line; on head, numerous, dense, large. Colour: olive to reddish brown on dorsal surface; cream to light brown on ventral surface; black blotches across body, 6; heavily barred with dark brown or black on fins except pelvics. Colours often very bright with yellow, orange, green and blue in various distributions according to habitat.

Length to 7½ inches.

Distinguished by the bluntly rounded head, the single blunt preopercular spine on each side of the head, the dense multifid cirri on each lateral line and the head and the somewhat forward position of the anus.

The globe-headed sculpin was first recorded from British Columbia waters in 1866 by J. K. Lord as *Centridermichthys globiceps*, but from no specific locality. It was listed in 1901 from the Queen Charlotte islands by W. H. Osgood as *Blenicottus globiceps* (evidently a misprint for *Blennicottus*). Probably the species is not uncommon in the tide-pools and shallow waters of the exposed coast. Specimens have been taken at Victoria, on the west coast of Vancouver island from Ucluelet to Kyuquot and from the Queen Charlotte islands. The name "*globiceps*" refers to the globular shape of the head.

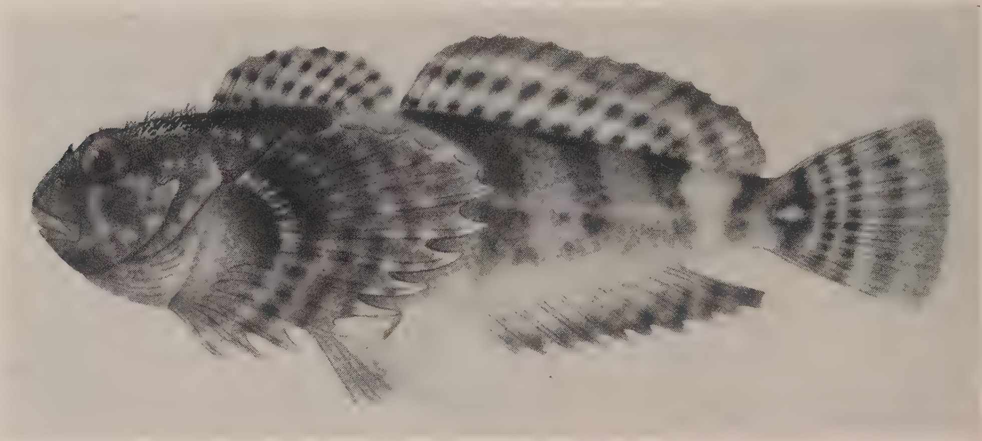

FIGURE 195. Globe-headed sculpin. *Clinocottus globiceps* (Girard) 1857

Range southern California to northwestern Alaska.

Mossy sculpin *Clinocottus embryum* (Jordan and Starks) 1895

Body elongate, moderately slender, slightly compressed. Head acute, anterior profile pointed; mouth terminal, small; lower jaw barely included; lips thick; snout blunt; spines: nasal, short, blunt; preopercular, 1, small, blunt, covered with skin; gill membranes united, free from isthmus. Anus about half distance between insertion of pelvic fins and origin of anal fin. Anal papilla stout, conical, usually curved forward. Skin: moderately thick, smooth. Fins: dorsal (2), VIII to X—15 to 17; anal, 9 to 12, membranes deeply incised, origin below anterior third of rayed dorsal fin; pelvic, I, 3, thoracic; pectoral, very large; caudal, truncate to rounded. Lateral line: high anteriorly, decurved, then straight. Scales: absent. Pores: on lateral line, 34 to 38. Cirri: multifid; in row on anterior third of lateral line; on head, scattered, large. Colour: light olive green to pink or rich maroon on dorsal surface; light green to dusky on ventral surface; brownish green blotches across body, 5 or 6; brown to black triangular spot surrounded by light brownish orange below each eye; brown to orange bars on all fins except pelvics.

Length to 2¾ inches.

Distinguished by the sharp pointed head in dorsal view, the single blunt preopercular spine on each side of the head, the triangular dark spot below each eye, the multifid cirri on the anterior third of each lateral line and on the head and the forward position of the anus.

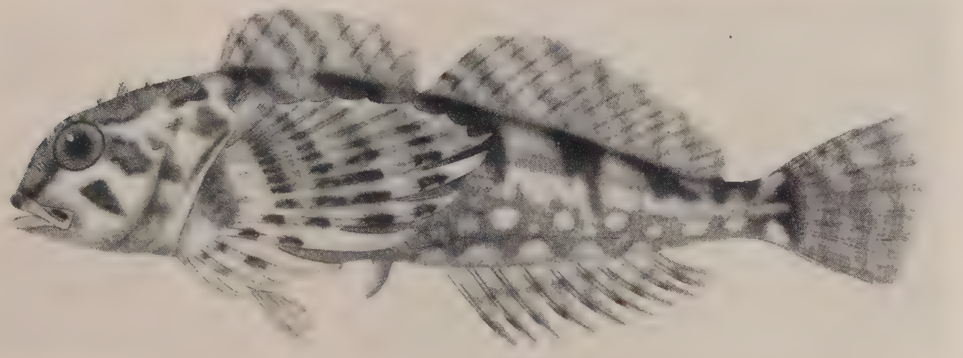

FIGURE 196. Mossy sculpin. *Clinocottus embryum* (Jordan and Starks) 1895

The mossy sculpin was first taken in British Columbia waters in June, 1909, at Ucluelet by Messrs. C. H. Young and W. Spreadborough. This was a single individual 2¾ inches in length and was recorded in 1920 by B. A. Bean and A. C. Weed as *Oxycottus embryum* (Jordan and Starks). The species has been secured in Departure bay and on the west coast of Vancouver island from Ucluelet to Nootka island. It probably is not uncommon in the rocky littoral areas.

Range northern California to northwestern Alaska.

Sharp-nosed sculpin *Clinocottus acuticeps* (Gilbert) 1895

Body elongate, slender, slightly compressed. Head acute, anterior profile pointed; mouth terminal, small; lower jaw barely included; snout sharply pointed; spines: nasal, short, sharp; preopercular, 1, small, simple, sometimes weakly bifid, slender, sharp, curved upward and inward, tip exposed; gill membranes united, free from isthmus. Anus one-third distance between insertion of pelvic fins and origin of anal fin. Anal papilla large, flattened anteroposteriorly, expanded laterally, ending abruptly in narrow conical tip beyond lateral expansions. Skin: smooth, firm. Fins: dorsal (2), VII to IX—14 to 16; anal, 10 to 13, origin below anterior third of rayed dorsal fin; pelvic, I, 3, thoracic; pectoral, large; caudal, rounded. Lateral line: high anteriorly, decurved, then straight. Scales:

absent. Pores: on lateral line, 33 to 36. Cirri: simple; in row along lateral line to point opposite tip of pectoral fin, small filamentous; on head, scattered, filamentous; on eyeball, 1, filamentous, sometimes minute or absent in female. Colour: green to light brown on dorsal surface, varying with surroundings; white to cream on ventral surface; irregular dark brown band along each side of body extended dorsally to form 6 saddles across back; variously blotched with light colours along lateral line and below; dark bars radiating from eye, 3; dusky area on spinous dorsal fin between first and third spines.

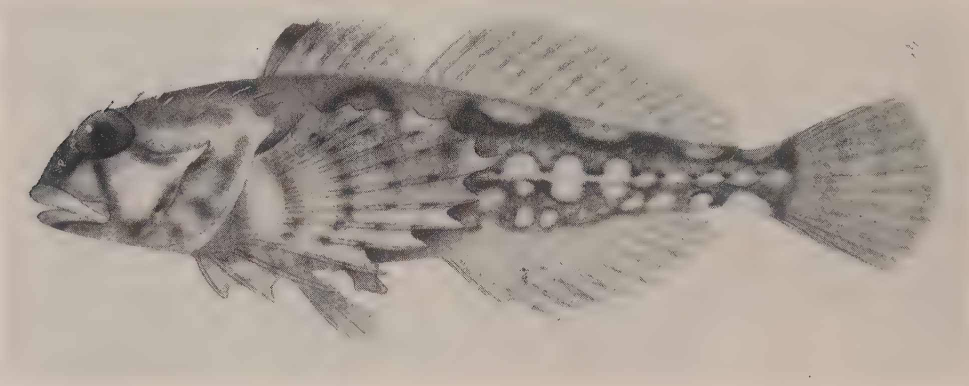

FIGURE 197. Sharp-nosed sculpin. *Clinocottus acuticeps* (Gilbert) 1895

Length to 2 inches.

Distinguished by the acute snout, the slender sharp incurved preopercular spine on each side of the head, the forward position of the anus, the filamentous cirri, the small cirrus on each eyeball and the dusky area on the anterior tip of the spinous dorsal fin.

The sharp-nosed sculpin was first taken in British Columbia waters between May 10 and May 13, 1890, in Departure bay, by the *Albatross*, in a shore seine and recorded in 1895 by C. H. Gilbert as *Oligocottus acuticeps* Gilbert. The species is found along the coast in tide-pools and on sandy beaches. Specimens have been obtained near Victoria, at False narrows, in Departure and Deep bays, along the west coast of Vancouver island from Vargas island to Kyuquot, in Dean channel and in Prince Rupert harbour.

Range northern California to northwestern Alaska.

Rosy-lipped sculpin *Ascelichthys rhodorus* Jordan and Gilbert 1880

Body elongate, stout anteriorly, compressed posteriorly. Head depressed, broad; mouth terminal, large; lower jaw included; snout bluntly rounded; spines: nasal, covered with skin; preopercular, 1, small, simple, sharp, curved upward, usually covered with skin; gill membranes united, free from isthmus. Anus slightly in advance of anal fin. Anal papilla small, rounded. Skin: smooth, loose. Fins: dorsal (1), VIII to X, 17 to 20, deeply notched, spinous portion low, weak, rayed portion about twice height of spinous portion; anal, 13 to 16; pelvic, absent; caudal, rounded. Lateral line: faint, decurved, then straight. Scales: absent. Pores: on lateral line, 34 to 38. Cirri: on head above and behind eye, 1, multifid; above base of pectoral fin, 5 to 9, filamentous. Colour: dark olive brown to black on dorsal surface; lighter on ventral surface; dark blotches across body vague; bright rosy red on lips, dusky on spinous portion of dorsal fin, margined with bright crimson; dusky on other fins, pale on margins; faintly barred with dark green to black on pectoral, anal and caudal fins.

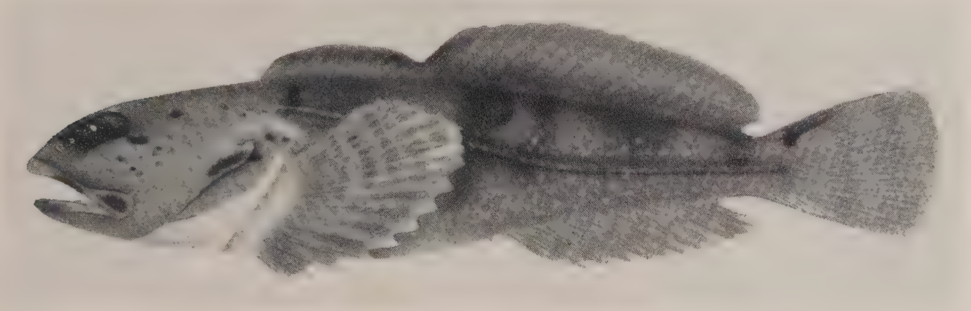

FIGURE 198. Rosy-lipped sculpin. *Ascelichthys rhodorus* Jordan and Gilbert 1880

Length to 4½ inches.

Distinguished by the absence of pelvic fins, the low spinous portion of the dorsal fin and the hooked preopercular spine on each side of the head.

The rosy lipped sculpin was first taken in British Columbia waters at Victoria by Messrs. Dall and Brown and recorded in 1881 by T. H. Bean. The species has been obtained along the coast near Victoria, Telegraph and Departure bays, Comox, on the west coast of Vancouver island from Ucluelet to Nootka island, and around the Queen Charlotte islands. It is tide-pool fish and is often found under rocks at low tide.

Range northern California to southeastern Alaska.

Spiny-headed sculpin *Dasycottus setiger* Bean 1890

Body elongate, stout anteriorly. Head large; mouth terminal, large, oblique; snout bluntly rounded; spines: nasal, absent; cranial, numerous, large, upright, blunt, occipital largest; preopercular, 4, simple, upper 2 shorter than diameter of eye, slender, lower 2 small, usually covered with skin; gill membranes united, free from isthmus. Anus two-thirds distance between insertion of pelvic fins and origin of anal fin. Anal papilla small, rounded. Skin: thin, loose; thick at bases of dorsal and anal fins. Fins: dorsal (2), IX or X—13 to 15, slightly connected at bases by low membrane; anal, 13 or 14; pelvic, I, 3, thoracic; pectoral, large, procurrent; caudal, rounded. Lateral line; slightly decurved, then straight. Scales: reduced ctenoid, in form of dome-shaped plates embedded in papillae, each with numerous spines: below spinous dorsal fin in row, 7 to 9; on head, behind occipital spine, 5; on upper margin of eyeball, scattered, minute. Pores: on lateral line, 14 or 15. Cirri: on lateral line pores, filamentous; on head, numerous, filamentous, longer ones in and about jaws; on upper margin of eyeball, minute. Colour: gray with chocolate brown spots on dorsal surface; pale brownish white on ventral surface, darker posteriorly; dark brown saddles across body, 5 or 6; black punctulations on all fins, minute; broad bars on all fins except pelvic.

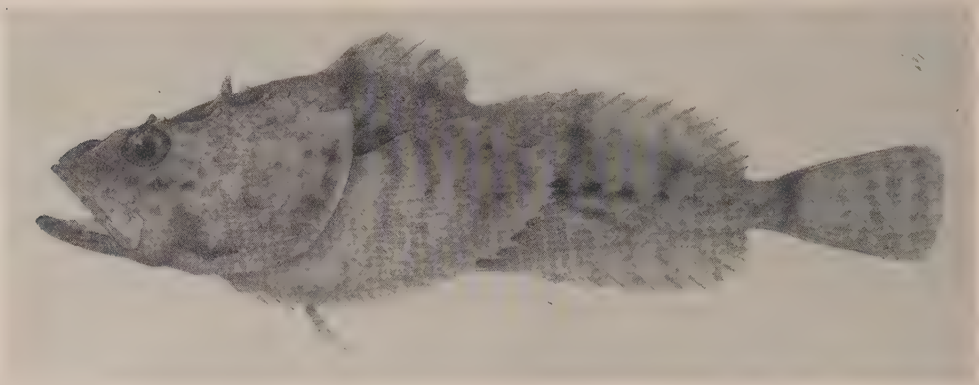

FIGURE 199. Spiny-headed sculpin. *Dasycottus setiger* Bean 1890

Length to 9 inches.

Distinguished by the large head with the upright blunt spines, the loose skin, the short row of conical spinous papillae near the base of the spinous dorsal fin and the dorsal fins slightly connected at their bases by low membranes.

The spiny-headed sculpin was first taken in British Columbia waters June 19, 1903, in Nanaimo harbour by the *Albatross*, station 4191, lat. 49° 11′ N., long. 123° 54′ W., depth 54 fathoms and the single specimen secured was recorded in 1907 by B. W. Evermann and E. L. Goldsborough. The species is common in the strait of Georgia and is obtained in shrimp trawls in Burrard inlet and English bay at depths between 10 and 60 fathoms, in otter trawls in the channels amongst the islands along the east coast of Vancouver island between Sidney and Nanaimo, and has been collected off the west coast of Graham island at a depth of 60 fathoms.

Range Puget sound to northwestern Alaska.

Black-finned sculpin *Malacocottus kincaidi* Gilbert and Thompson 1905

Body elongate, stout anteriorly. Head large; mouth terminal, moderate; snout bluntly rounded; spines: cranial, absent; preopercular, 4, simple, upper three sharp, shorter than diameter of eye, lowermost very short, usually not projecting through skin; gill membranes united, broadly joined to isthmus. Anus two-thirds distance between insertion of pelvic fins and origin of anal fin. Anal papilla small, rounded. Skin: thin, smooth, loose, on body and along bases of fins. Fins: dorsal (2), VIII or IX—14 or 15, slightly connected at bases by low membrane, spines weak; anal, 11 or 12; pelvic, I, 3, thoracic, small; pectoral large, procurrent; caudal, rounded. Lateral lines: slightly decurved, then straight. Scales: absent. Pores: on lateral line, 14 or 15. Cirri: on anterior nasal openings, multifid; on head few, filamentous; on eyeball, small. Colour: gray to light brown with several irregular brown blotches on dorsal surface; bluish to purplish black with fine black punctulations on ventral surface; white in narrow band on margins of all fins, jet black in broad band below each margin; white bands on pectoral, rayed dorsal and caudal fins. In mature male, white margins of dorsal fins become golden in breeding season.

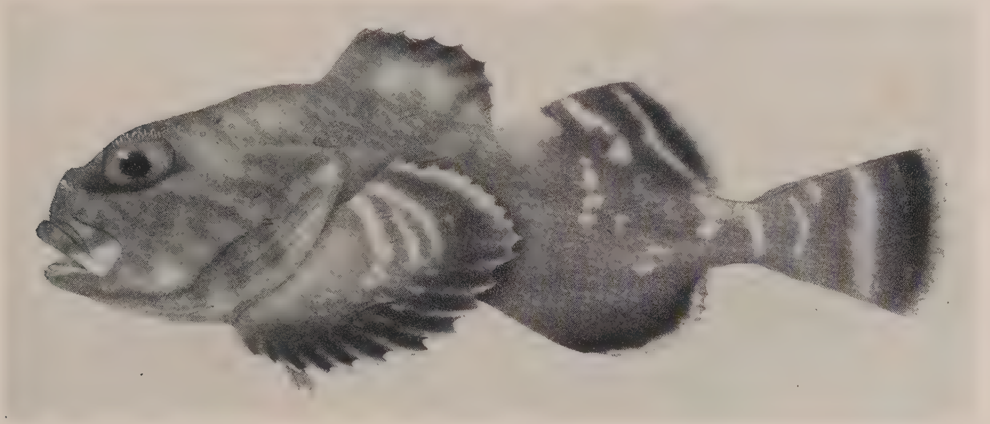

FIGURE 200. Black-finned sculpin. *Malacocottus kincaidi* Gilbert and Thompson 1905

Length to 8 inches.

Distinguished by the thin smooth loose skin, the gill membranes broadly joined to the isthmus and the jet black coloration on the fins with the white margins.

The black-finned sculpin was first taken in British Columbia waters off Entrance island, near Nanaimo, June 20, 1903, by the *Albatross*, station 4198, lat. 49° 19′ N., long. 123° 47′ W., depth 157 fathoms. It was recorded in 1907 by B. W. Evermann and E. L. Goldsborough as *Malacocottus zonurus* Bean in error, the type of *M. kincaidi* having been described in 1905, probably while the *Albatross* records were in press. The species is common in the strait of Georgia at depths ranging from 15 to 65 fathoms and is often captured in shrimp trawls in Burrard inlet and in otter trawls along the east coast of Vancouver island.

Range Puget sound to strait of Georgia.

In the mud-sculpins the body is somewhat tadpole-shaped, covered with smooth loose skin devoid of scales. The head is large without spines. The dorsal fin is low anteriorly and buried in the skin; the pelvic fins are thoracic, each with 1 spine and 3 rays.

The mud-sculpins sometimes are referred to as degenerate fishes but perhaps more correctly they should be considered as specialized for life in muddy waters.

Tadpole sculpin *Psychrolutes paradoxus* Günther 1861

Body elongate, stout anteriorly, somewhat tadpole-shaped; caudal peduncle short, distinct. Head large, broad; mouth terminal, small; jaws equal; snout very blunt; spines: absent; gill membranes broadly joined to isthmus. Anus midway between insertion of pelvic fins and origin of anal fin. Skin: smooth, somewhat loose, on body, head and fins. Fins: dorsal (1), X to XII, 12 to 17, continuous, spinous portion and anterior of rayed portion very low, buried in ridge of skin, delicate spines and first few rays not countable without dissection, posterior of rayed portion high; anal, 12 to 14, high; pelvic, I, 3, thoracic; pectoral, 20 to 23; caudal, truncate to rounded. Lateral line: straight, indistinct. Scales: absent; papillae small, scattered, on body, head and fins, on eyeball in row on upper margin. Pores: on lateral line, about 10. Colour: gray to light brown on dorsal surface; creamy white on ventral surface; black cross bands and light cross blotches across back, irregular; pale orange, pink and yellow variously marking pectoral fins; black bar across each pectoral fin toward tip, prominent; dark cross bar toward tip of caudal fin.

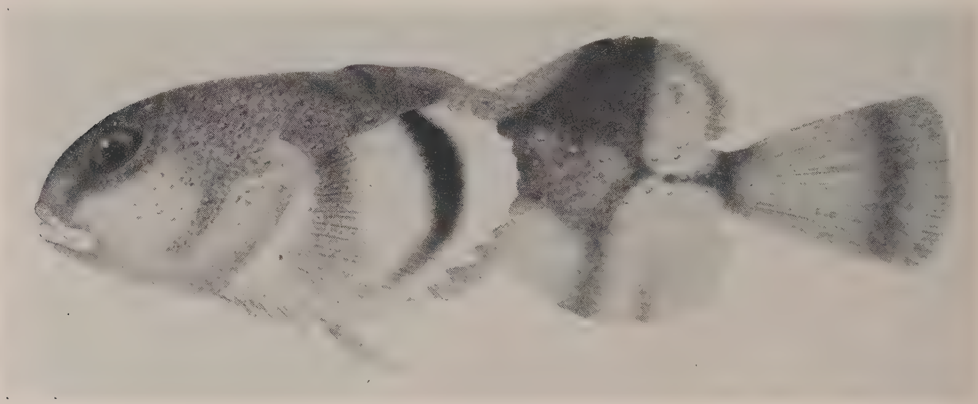

FIGURE 201. Tadpole sculpin. *Psychrolutes paradoxus* Günther 1861

Length to 2½ inches.

Distinguished by the general tadpole-like appearance, the anus situated midway between the insertion of the pelvic fins and the origin of the anal fin, the low spinous portion of the dorsal fin and the smooth somewhat loose skin on the head and body with the scattered small papillae.

The tadpole sculpin was first taken in British Columbia waters in the strait of Georgia during a voyage of H.M.S. *Plumper*, and the specimen, 21 lines (1¾ inches) in length, was presented by the Lords of the Admiralty to the British Museum. It was described in 1861 by A. Günther as the type of a new genus and species. The next record was August 28, 1891, west of Jordan river by the *Albatross*, station 3460, lat. 48° 25′ N., long. 124° 10′ W., depth 53 fathoms, and recorded in 1895 by C. H. Gilbert as *Psychrolutes zebra* Bean. The species apparently is well distributed along the coast, many individuals having since been secured off the southern end of Vancouver island, at Pender island in Otter bay, and in Burrard and Skidegate inlets. It inhabits waters from moderate depths down to at least 120 fathoms.

Range Puget sound to northwestern Alaska.

Soft sculpin *Gilbertidia sigalutes* (Jordan and Starks) 1895

Body elongate, stout anteriorly, somewhat tadpole-shaped; caudal peduncle hidden in loose skin connecting anal and caudal fins. Head large, broad; mouth terminal, moderate; lower jaw projecting; snout blunt; spines: absent; gill membranes broadly joined to isthmus. Anus immediately in front of anal fin. Skin: smooth, very loose on body, head and fins. Fins: dorsal (1), about VIII, 18, continuous, anterior portion very low, buried in skin, becoming elevated posteriorly, spines and rays not countable without dissection; anal, about 14, high posteriorly; pelvic, I, 3, thoracic; pectoral, 16 or 17; caudal, rounded. Lateral line: straight, indistinct. Scales: absent. Pores: on lateral line, 12 to 14. Colour: dusky olive brown on dorsal surface; lighter on ventral surface; blue tinge on fins, sometimes on body.

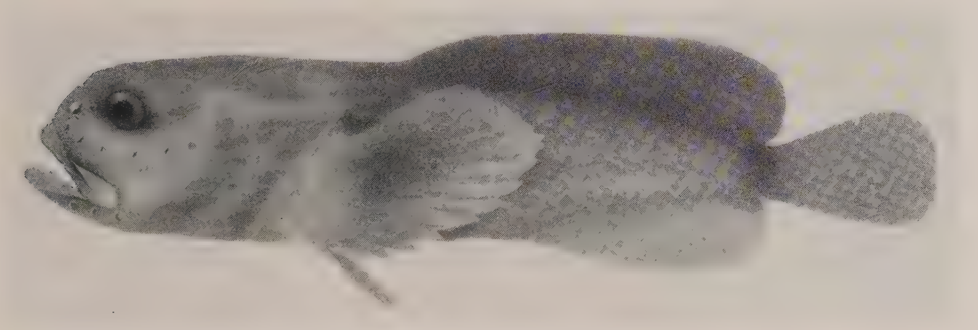

FIGURE 202. Soft sculpin. *Gilbertidia sigalutes* (Jordan and Starks) 1895

Length to 3¼ inches.

Distinguished by the general tadpole-like appearance, the anus immediately in front of the anal fin, the low anterior portion of the dorsal fin, the very loose skin on the head and body and the projecting lower jaw.

The soft sculpin was first taken in British Columbia waters May 23, 1936, in English bay off Jericho beach in a shrimp trawl at a depth of 35 fathoms. The single specimen obtained is now in the collection of fishes at the University of British Columbia. In July, 1937, a specimen was taken from the stomach of a handsaw-fish, *Alepidosaurus aesculapius*, captured off Quatsino sound near Kains island on a trolling spoon at a depth of approximately 30 fathoms, and is now in the Provincial Museum at Victoria. These captures were recorded in 1945 by G. C. Carl and G. V. Wilby. In the Puget sound area this sculpin has been found in sponges at a depth of 60 fathoms.

Range Puget sound to southeastern Alaska.

Family RHAMPHOCOTTIDAE Big-headed sculpins

In the big-headed sculpins the head is very large with prominent fronto-parietal ridges; the snout is long and pointed. The gill openings are small and situated above the bases of the pectoral fins. The pectoral fins are large and exserted; the pelvic fins are thoracic, each with 1 spine and 3 rays.

The grunt-fish is the only species in the family.

Grunt-fish *Rhamphocottus richardsoni* Günther 1874

Body short, stout, compressed; caudal peduncle slender. Head very large, elongate, length about half standard length, broad, with large fronto-parietal ridges; mouth terminal, small; lower jaw included; lips thick; snout long, pointed; eye deep-set; spines nasal, stout, sharp; preopercular, 1, weakly bifid; post-temporal, moderate; clavicular large, sharp; gill opening small, above base of pectoral fin. Anus three-quarters distance between insertion of pelvic fins and origin of anal fin. Anal papilla short, conical. Fins: dorsal (2), VII or VIII—12 or 13, spinous fin small, weak, folding in groove; anal, 6 or 7, far back; pelvic, I, 3, thoracic; pectoral very large, lower rays thickened, greatly exserted; caudal, rounded. Lateral line: high anteriorly, roughly following dorsal contour. Scales: on body and head reduced to minute plates bearing stiff multifid spines, each embedded in erect fleshy papilla; on eyeball, minute, in four or five rows on upper margin. Pores: on lateral line, about 25, small, elevated. Colour: creamy yellow on dorsal surface, barred with dark brown streaks passing downward and forward; creamy yellow to pale red on ventral surface; creamy brown on head with dark brown blotches; dark streaks around eye extending onto cornea; clear coral red margined with crimson on rayed dorsal, pectoral, anal and caudal fins; orange on exserted rays of pectoral fins and on pelvic fins; black spots scattered on spinous dorsal fin and in series at base of each ray of rayed dorsal fin.

Length to 3 inches.

Distinguished by the large head with the prominent fronto-parietal ridges, the prolonged snout, the restricted gill openings, the greatly exserted lower rays of the large pectoral fins and the brown and cream coloration.

The grunt-fish was first taken in British Columbia waters at Fort Rupert by H.M.S. *Plumper* and the British Museum obtained the specimen by purchase. This was dexcribed in 1874 by A. Günther as the type of a new genus and species. The grunt-fish occurs along the whole coast in tide-pools and shallow water usually along rocky shores but it has been secured in seines on sandy beaches and in trawls down to a depth of 90 fathoms. The food consists to some extent of small crustaceans. This bizarre highly-coloured fish is, perhaps, the comedian amongst fishes. It crawls deliberately over rocks and seaweeds on its long pectoral fin rays, using them as "fingers" and turns its head slowly from side to side. When it rolls its eyes independently of one another, suddenly bringing the dark streaks on the eyeball alternate with those surrounding it, the observer has the feeling that he has been winked at. When removed from the water this fish makes a half grunt, half hissing sound, hence the name grunt-fish.

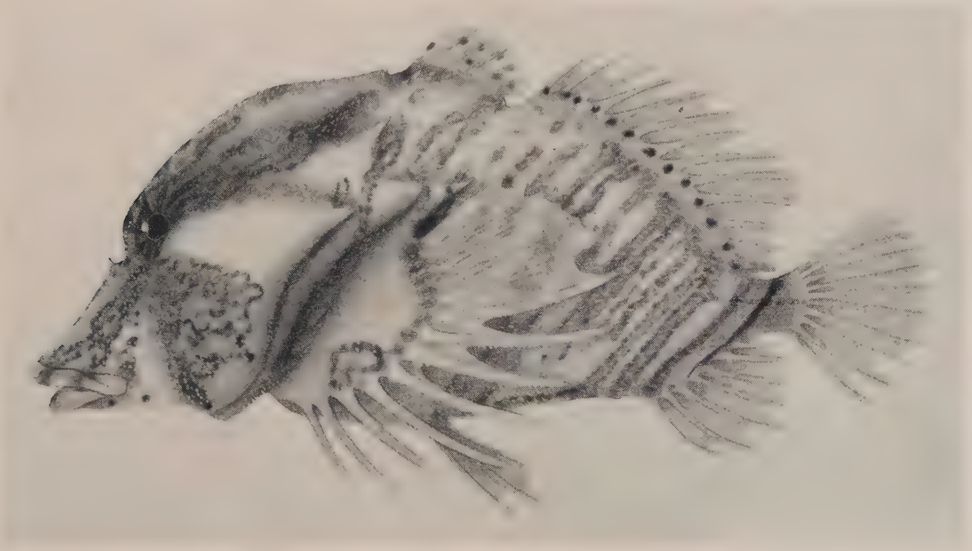

FIGURE 203. Grunt-fish. *Rhamphocottus richardsoni* Günther 1874

Range northern California to northwestern Alaska.

Family AGONIDAE Sea-poachers

In the sea-poachers the body is completely covered with an armour of bony plates which do not overlap and do not have free margins. The pelvic fins are thoracic, each with 1 spine and 2 rays, and are frequently shorter in the female than in the male.

The sea-poachers are distributed, for the most part, in the cold waters of northern regions, living on rocky or muddy bottoms at depths ranging from 10 to 339 fathoms and are seldom taken except in the trawls of commercial fishermen or of scientific expeditions. Two species, however, are found occasionally in tide-pools.

Four-horned sea-poacher

Hypsagonus quadricornis (Cuvier and Valenciennes) 1829

Body elongate, stout anteriorly, compressed; outline rising abruptly at origin of spinous dorsal fin, rising slightly before origin of rayed dorsal fin. Head somewhat compressed, slightly depressed at occiput; mouth terminal, small; lower jaw projecting; snout bluntly rounded; eye large, elevated; cranial ridges high; spines: nasal, sharp, curved; frontal, erect; preopercular, 4, blunt; gill membranes united, free from isthmus. Fins: dorsal (2), IX to XI—6 or 7; anal, 9 or 10; pelvic, I, 2, thoracic; caudal, asymmetrically rounded. Lateral line: nearly straight. Plates: on body, spinous. Pores: on lateral line, 15 to 19, first single, remainder paired, each pair, separated by spine, on body plate. Cirri: nasal, single, median, elongate, sometimes branched. Colour: senna brown with various markings of yellow to carmine on dorsal surface; paler on ventral surface; brown to black bars across body and fins, several, narrow; black on posterior margin of caudal fin.

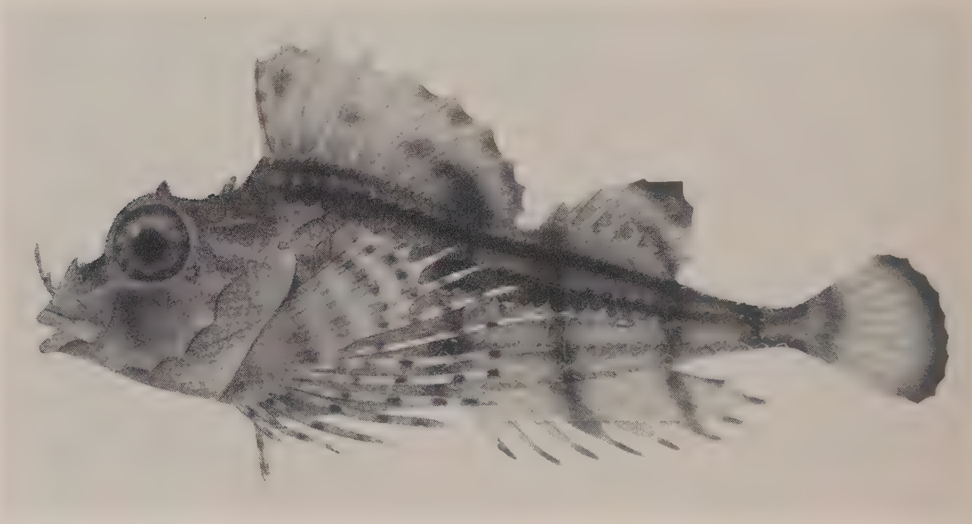

FIGURE 204. Four-horned sea-poacher. *Hypsagonus quadricornis* (Cuvier and Valenciennes) 1829

Length to 2½ inches.

Distinguished by the stout body with spinous plates, the high-set eyes, the prominent spines on the top of the head, the prominent elevation of the body under the spinous dorsal fin, the gill membranes free from the isthmus and the elongate cirrus on the snout.

The four-horned sea-poacher was first taken in British Columbia waters September 4, 1891, in Juan de Fuca strait by the *Albatross*, station 3465, lat. 48° 21′ N., long. 123° 14′ W., depth 48 fathoms, recorded in 1895 by C. H. Gilbert. Two other individuals, also obtained by the *Albatross*, were secured June 19, 1903, in Queen Charlotte strait off Fort Rupert, station 4204, at a depth of 69 fathoms. The species occurs in shallow water, including tide-pools and at depths down to 70 fathoms. A hydroid, *Perigonimus pugetensis* Heath, is found frequently in large numbers on this fish giving it a somewhat plumose appearance.

Range Puget sound to northwestern Alaska.

Warty sea-poacher *Occa verrucosa* (Lockington) 1880

Body elongate, stout anteriorly. Head depressed; mouth terminal, small; lower jaw prominently projecting; snout bluntly rounded; eye moderate; cranial ridges, low; spines: nasal small, sharp; others minute or absent; gill membranes united, free from isthmus. Fins: dorsal (2), VII to IX—7 or 8; anal, 10 to 12; pelvic, I, 2, thoracic; caudal, rounded. Lateral line: nearly straight. Plates on body: spinous on ridges, smooth elsewhere. Pores: on lateral line, 36 to 38, single. Cirri: near posterior tip of maxillary, 1. Colour: dark gray or light brown on dorsal surface; paler on ventral surface; brownish black saddle-like markings in series of six or more across back and sides; dusky on dorsal fins, black on caudal fin; pectoral fins washed with orange, dark blotches on upper portion, 2. In male, orange yellow on pelvic fins; in female, pale.

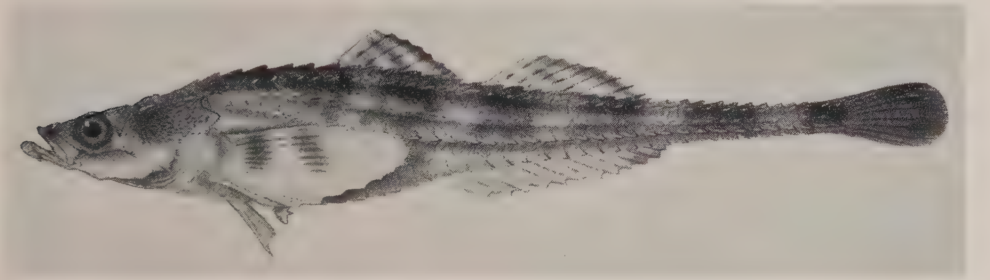

FIGURE 205. Warty sea-poacher. *Occa verrucosa* (Lockington) 1880

Length to 8 inches.

Distinguished by the prominently projecting lower jaw, the weakly developed spines on the top of the head and the gill membranes free from the isthmus.

The warty sea-poacher was first taken in British Columbia waters August 20, 1945, in Wickaninnish bay off Florencia island by Mr. W. E. Barraclough and the three specimens are now in the collection of the Pacific Biological Station.

This is the first record known from north of Oregon. The species occurs in waters from 11 to 36 fathoms.

Range California to Vancouver island.

Sturgeon-like sea-poacher *Agonus acipenserinus* Tilesius 1811

Body elongate, moderately stout anteriorly, general appearance somewhat sturgeon-like. Head large; mouth ventral, weakly protrusible; snout depressed, broadly pointed; spines: on tip of snout, 4, sharp, naked, anterior pair horizontal, parallel, posterior pair directed backward; nasal, sharp, sometimes multifid; frontal, sharp, slightly curved; gill membranes united, joined to isthmus with narrow fold posteriorly. Anus immediately behind bases of pelvic fins. Fins: dorsal (2), VIII to X—7 to 9; anal, 6 to 9; pelvic, I, 2, thoracic, in male length about equal to that of snout, in female length about half that of snout; caudal, truncate to rounded. Lateral line: high anteriorly, sharply decurved, then straight. Plates: on body spinous; on caudal peduncle, weakly spinous in older individuals. Pores: on lateral line, 37 to 40. Cirri: large, in two groups on each lower side of snout, outer simple, inner multifid; in group at each angle of mouth, on broad pedicel. Colour: light grayish brown on dorsal surface; light yellow to orange on ventral surface; orange spot under each eye; brownish black saddle-like markings in series of six or more across back and sides, with intermediate narrow brownish black streaks; dusky on dorsal, pectoral and caudal fins; obscurely barred on pectoral and caudal fins; creamy white on pelvic fins, sometimes black tipped in male; creamy white on anal fin with brownish black blotch near posterior tip.

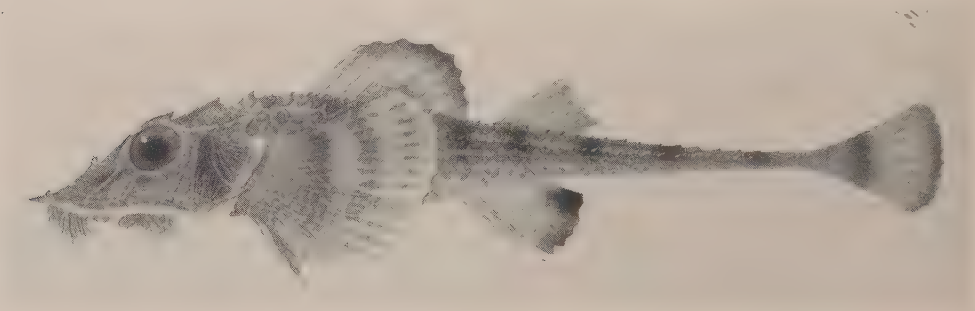

FIGURE 206. Sturgeon-like sea-poacher. *Agonus acipenserinus* Tilesius 1811

Length to 12 inches.

Distinguished by the sturgeon-like appearance, the four sharp naked spines at the tip of the snout, the inferior mouth and the large clusters of elongate cirri below the snout and on pedicels at each angle of the mouth.

The sturgeon-like sea-poacher was first taken in British Columbia waters near Vancouver island by H.M.S. *Plumper* and was presented to the British

Museum by the Lords of the Admiralty where it was identified and recorded in 1860 by A. Günther. In 1881, T. H. Bean recorded this species from Vancouver island as *Podothecus acipenserinus* (Pallas). This sea-poacher is common along the whole coast of the province with records from Victoria and English bay to Graham island at Rose spit. It is obtained chiefly in shrimp trawls on muddy bottoms and is probably the commonest sea-poacher in waters between 10 and 30 fathoms. The food consists in part of crustaceans and marine worms.

Range Puget sound to northwestern Alaska.

Window-tailed sea-poacher *Averruncus emmelane* Jordan and Starks 1895

Body elongate, moderately stout anteriorly. Head moderate; mouth subterminal, small; snout depressed, narrowly pointed, with median pit near tip; spines: on tip of snout, 4, anterior pair directed forward and upward, covered with skin, posterior pair sharp, naked, directed backward; nasal, sharp, sometimes multifid; prefrontal, multifid; frontal, blunt; on eyeball in three or four rows, variable in number and size; occipital pit with slight longitudinal median ridge; gill membranes united, joined by isthmus. Anus behind bases of pelvic fins by width of two plates. Fins: dorsal (2), VIII to XI—7 or 8; anal, 10 to 12; pelvic, I, 2, thoracic, in male, extending well beyond anus, in female, extending barely beyond anus; pectoral, broad, lower rays exserted; caudal, rounded. Lateral line: nearly straight. Plates: on body spinous; on caudal peduncle, weakly spinous in older individuals. Pores on lateral line: 38 to 42. Cirri: simple, small; in rows on lower side of snout, lower jaw and branchiostegal membranes. Colour: light brown on dorsal surface; white to brownish white on ventral surface; dark brown to black saddle-like markings in series of six or more across back and sides; black on tip of snout; black and white on all fins; white on tips of pectoral, pelvic, anal and caudal fins; conspicuous semi-transparent light spot, not reaching margin, on caudal fin.

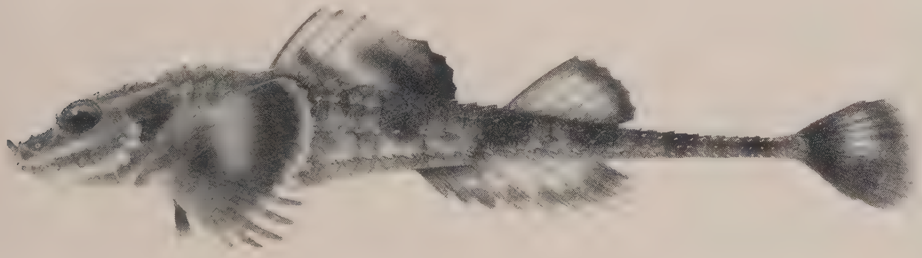

FIGURE 207. Window-tailed sea-poacher. *Averruncus emmelane* Jordan and Starks 1895

Length to 8 inches.

Distinguished by the pointed snout with the two blunt skin-covered spines, the slightly inferior mouth, the small cirri in rows below the snout, on the lower jaw and on the branchiostegal membranes and the conspicuous semi-transparent light spot on the caudal fin not reaching the margin.

The window-tailed sea-poacher was first taken in British Columbia waters March 20, 1907, at Mayne island and the single specimen is now in the collection of fishes at the Pacific Biological Station. In 1908 two individuals were obtained at Esquimalt and these are now in the Provincial Museum at Victoria. The first published record of the species from the province is that of three specimens secured in June and July, 1909, at Ucluelet, by Messrs. C. H. Young and W. Spreadborough at a depth of 30 fathoms and recorded in 1920 by B. A. Bean and A. C. Weed. The window-tailed sea-poacher is common in the strait of Georgia and Burrard inlet and it also has been found at Victoria and off the west coast of Vancouver island. One individual from the latter locality was removed from the stomach of a handsaw-fish, *Alepidosaurus aesculapius*. This sea-poacher is taken frequently in shrimp trawls on muddy bottoms at depths between 10 and 75 fathoms.

Range southern California to southeastern Alaska.

Black-finned sea-poacher *Bathyagonus nigripinnis* Gilbert 1890

Body elongate, slender. Head somewhat depressed; mouth terminal, small; lower jaw projecting; snout depressed, broadly rounded; rostral plate terminal, movable; spines: on rostral plate, 5, minute, upright, diverging; nasal, small, sharp, recurved; frontal, small, erect; on eyeball, absent; gill membranes united, broadly joined to isthmus. Fins: dorsal (2), VI to VIII—6 or 7; anal, 7 to 9; pelvic, I, 2, thoracic; pectoral, broad; caudal, truncate to rounded. Lateral line: nearly straight. Plates: on body spinous, except ventral series behind anal fin. Pores: on lateral line, 40 to 44; on suborbital and dentary bones, large. Cirri: near posterior tip of maxillary, 2. Colour: light brown on dorsal surface; dusky light brown on ventral surface; blue black on ventral surface of head; intensely blue black on all fins.

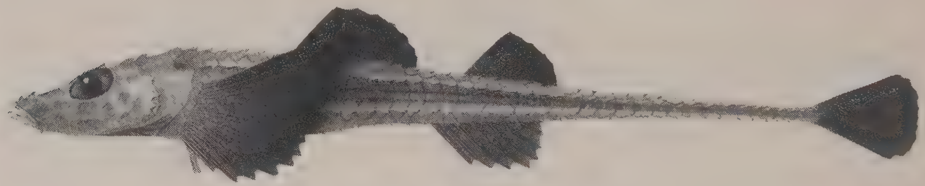

FIGURE 208. Black-finned sea-poacher. *Bathyagonus nigripinnis* Gilbert 1890

Length to 8 inches.

Distinguished by the blue black fins, the broadly rounded snout and the protruding lower jaw.

The black-finned sea-poacher was first taken in British Columbia waters June 19, 1903, in Nanaimo harbour by the *Albatross*, station 4191, lat. 49° 11′ N., long. 123° 54′ W., depth 54 fathoms, and recorded in 1907 by B. W. Evermann and E. L. Goldsborough. It has been secured only in the vicinity of the strait of Georgia at depths ranging from 50 to 230 fathoms. It is known to occur at much greater depths off the coasts of Washington and Alaska and even to 682 fathoms off Kamchatka. In English bay and in Burrard inlet at Bedwell bay it is captured frequently in shrimp trawls when operated at 50 fathoms and lower.

Range Washington to northwestern Alaska.

Pigmy sea-poacher *Odontopyxis trispinosus* Lockington 1879

Body elongate, slender. Head somewhat depressed; mouth terminal, small; jaws about equal; snout depressed, narrowly pointed; rostral plate terminal, movable; spines: on rostral plate, 1, small, upright; nasal, sharp; frontal, strongly recurved; on eyeball, 3 to 5, in single row; occipital pit shallow to deep, with slight median longitudinal ridge; gill membranes united, joined to isthmus. Fins: dorsal (2), III to VI—6 or 7; anal, 5 to 7; pelvic, I, 2, thoracic; pectoral broad, lower 5 to 7 rays exserted; caudal, rounded. Lateral line: decurved anteriorly, then straight, wavy posteriorly. Plates: on body, spinous; dorsolateral ridges usually separate, continuous on either side of spinous dorsal fin to occiput, in some individuals ridges join on median line anterior to spinous dorsal fin for short distance but separate posterior to occiput. Pores: on lateral line, 35 to 38. Cirri: near posterior tip of maxillary, 1, small. Colour: gray to olive green on dorsal surface; lighter on ventral surface; brownish black saddle-like markings in series of six or more across back and sides; dusky on dorsal and caudal fins with white on margin; black and brown in narrow bars on pectoral fins; white on pelvic and anal fins.

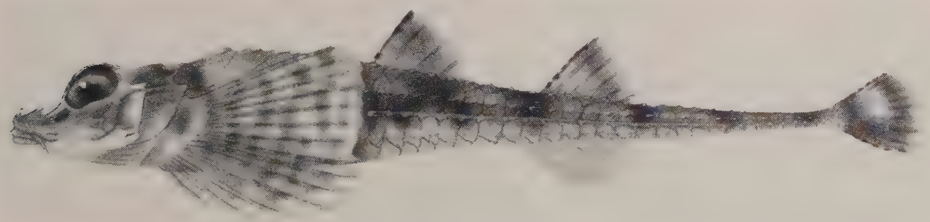

FIGURE 209. Pigmy sea-poacher. *Odontopyxis trispinosus* Lockington 1879

Length to 3⅛ inches.

Distinguished by the small slender body, the pointed snout with the single upright rostral spine and the partially-divided occipital pit.

The pigmy sea-poacher was first taken in British Columbia waters June 20, 1903, in the strait of Georgia near Bowen island by the *Albatross*, station 4193, lat. 49° 20′ N., long. 123° 43′ W., depth 23 fathoms and recorded in 1907 by B. W. Evermann and E. L. Goldsborough. It is common in the strait of Georgia, Burrard inlet and Nanoose bay and has been collected at Ucluelet. The pigmy sea-poacher inhabits sandy or rocky bottoms and is taken in shrimp trawls at depths from 10 to 40 fathoms. In California waters it has been recorded as being found at depths down to 204 fathoms.

Range southern California to southeastern Alaska.

Deep-pitted sea-poacher *Bothragonus swanii* (Steindachner) 1877

Body elongate, stout anteriorly, compressed posteriorly. Head large, depressed, broad posteriorly; mouth terminal, small; jaws about equal; snout bluntly pointed; rostral plate terminal, rigid, bluntly rounded; spines: absent from rostral plate and nasal bones; on eyeball, small, sharp, in two rows, middle spine of lower row large; occipital pit very large, deep, depth nearly half that of head, transverse, somewhat oval, spinous processes several, small, blunt, extending from posterior margin into cavity; gill membranes united, broadly joined to isthmus. Fins: dorsal (2), III—5, small; anal, 5; pelvic, I, 2, thoracic; caudal,

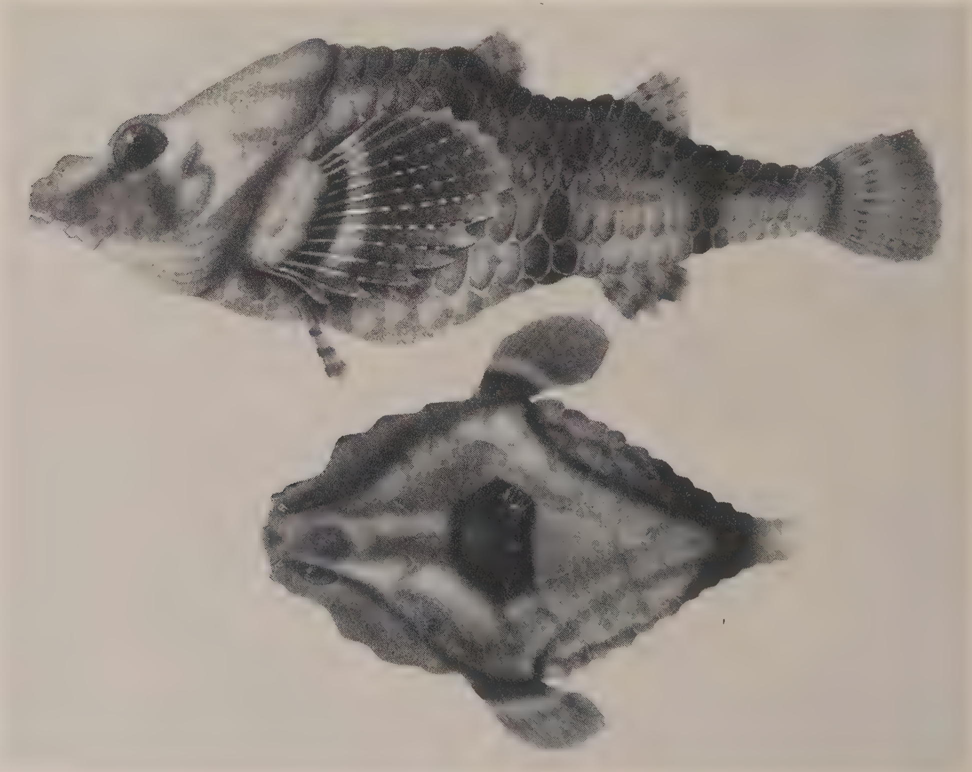

FIGURE 210. Deep-pitted sea-poacher. *Bothragonus swanii* (Steindachner) 1877

rounded. Lateral line: high anteriorly, decurved, then straight. Plates: on body, smooth; on head very bluntly rounded; on isthmus and branchiostegals, small, elevated. Pores: on lateral line, about 32. Cirri: on lips numerous, short, filamentous; on dentary pores, in rows; on isthmus, scattered. Colour: brown with black bars, orange with bluish bars or scarlet with brown bars, coloration very variable corresponding to environment; brown to black bars on dorsal, pelvic, anal and caudal fins; brown to black on pectoral fins, white band near base of each, prominent; white spots along rays of all fins.

Length to 2½ inches.

Distinguished by the stout body, the smooth plates and the broad head with the large cavity on the top.

The deep-pitted sea-poacher was first taken in British Columbia waters in the summer of 1909, when four specimens from 1¾ inches to 2¼ inches in length were collected at Ucluelet by Messrs. C. H. Young and W. Spreadborough and recorded in 1920 by B. A. Bean and A. C. Weed. Other individuals have been obtained from William head, Quatsino and Port Hardy in tide-pools.

Range Washington to Queen Charlotte strait.

Black-tipped sea-poacher *Xenopyxis latifrons* (Gilbert) 1890

Body elongate, slender. Head somewhat depressed; mouth terminal, small; jaws about equal; snout pointed; rostral plate small, terminal, rigid; spines: on rostral plate, 1, large, curved, upright; nasal, sharp, diverging; frontal, sharp; on eyeball, 3 to 5, well developed, sharp, in single row; gill membranes united, joined to isthmus with free fold posteriorly. Fins: dorsal (2), VI or VII—6 to 8; anal, 7 to 9; pelvic, I, 2, thoracic; pectoral, frequently with some of lower rays exserted; caudal, truncate to rounded. Lateral line: high anteriorly, sharply decurved, then straight. Plates: on body spinous except on ventral surface behind anal fin. Pores: on lateral line, 39 to 41. Cirri: near posterior tip of maxillary, 1, stout; near anterior tips of dentaries, 4, small. Colour: light brown on dorsal surface; lighter brown to cream on ventral surface; dark brown saddle-like markings in series of seven or eight across back and sides; pale brownish gray

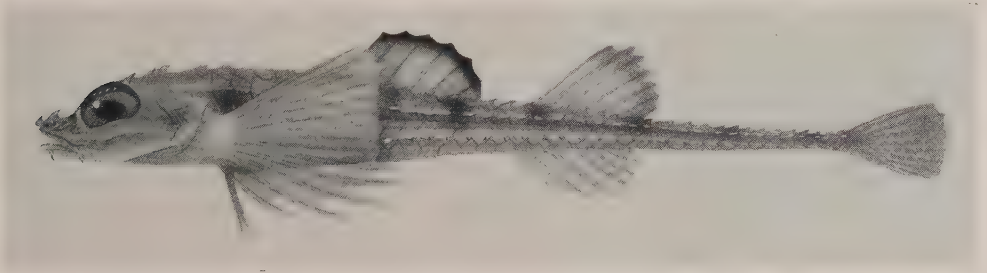

FIGURE 211. Black-tipped sea-poacher. *Xenopyxis latifrons* (Gilbert) 1890

on all fins; jet black on margins of spinous dorsal fin; dusky on margins of rayed dorsal and caudal fins.

Length to 7½ inches.

Distinguished by the single large rigid rostral spine and the black margin on the spinous dorsal fin.

The black-tipped sea-poacher was first taken in British Columbia waters June 20, 1903, in the strait of Georgia off Bowen island by the *Albatross*, station 4193, lat. 49° 20′ N., long. 123° 43′ W., depth 23 fathoms. This capture was recorded in 1907 by B. W. Evermann and E. L. Goldsborough as *Xenochirus pentacanthus* Gilbert. The error was discovered upon re-examination of the specimen by Dr. L. P. Schultz of the United States National Museum. The black-tipped sea-poacher is fairly common in southern British Columbia waters. It has been taken at Ucluelet, Porlier pass and in Northumberland channel at a depth of 60 fathoms, not infrequently in Burrard inlet and English bay from 10 to 50 fathoms. An individual was obtained April 20, 1933, in Sechelt inlet at Narrows arm from about 45 fathoms in water low in oxygen and having a strong odour of hydrogen sulphide. In California waters it has been recorded at depths from 50 to 218 fathoms.

Range southern California to southern British Columbia.

Gray star-snout *Asterotheca alascana* (Gilbert) 1895

Body elongate, slender. Head somewhat depressed; mouth terminal, small; jaws about equal; snout moderately pointed; rostral plate small, terminal, erect, movable; spines: on rostral plate, 5 or more, small, in form of star, three diverging upward, backward, one at each lower lateral angle, one or two additional spines usually projecting downward between lateral spines; nasal, sharp; frontal, sharp; lacrymal, absent; on eyeball, 6 to 8, in single row; occipital pit moderately deep, transverse; gill membranes united, joined to isthmus, without free fold posteriorly. Fins: dorsal (2), V to VIII—5 to 8, small, weak; anal, 6 to 8, origin below interspace between dorsal fins; pelvic, I, 2, thoracic; pectoral, broad, lower rays exserted; caudal, rounded. Lateral line: high anteriorly, sharply decurved, then

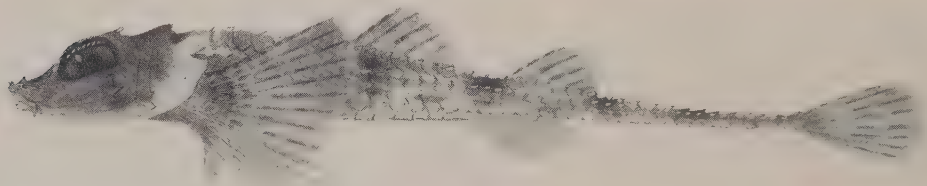

FIGURE 212. Gray star-snout. *Asterotheca alascana* (Gilbert) 1895

straight. Plates: on body, spinous; on ventrolateral series, spines absent; on lower lateral series, spines weak. Pores: on lateral line, 39 to 40. Cirri: at posterior tip of maxillary, 2, large; near anterior tips of dentaries, 2, small. Colour: greenish gray to light greenish brown on dorsal surface; very light brown on ventral surface; dark brown saddle-like markings in series of five or six across back and sides; dark brown bars on pectoral, dorsal and caudal fins; white on pelvic and anal fins.

Length to 5 inches.

Distinguished by the erect movable many-spined rostral plate, the absence of spines from the lacrymal bones and the anal fin origin below the interspace between the dorsal fins.

The gray star-snout was first taken in British Columbia waters August 27, 1891, in Juan de Fuca straight west of Race rocks, by the *Albatross*, station 3445, lat. 48° 16′ N., long. 123° 45′ W., depth 100 fathoms and was recorded in 1895 by C. H. Gilbert as *Xenochirus alascanus* Gilbert. The species is common along the coast and is captured frequently in Burrard inlet and English bay in shrimp trawls at depths ranging from 10 to 30 fathoms. It has been taken off Graham island in Rennell sound by the *Wm. J. Stewart* at 60 fathoms.

Range Puget sound to northwestern Alaska.

Spiny-cheeked star-snout *Asterotheca infraspinata* (Gilbert) 1904

Body elongate, slender. Head somewhat depressed; mouth terminal, small; jaws about equal; snout moderately pointed; rostral plate small, terminal, erect, movable; spines: on rostral plate, 5 or more, small, in form of star, three diverging upward, backward, one at each lateral angle, one or two additional spines usually projecting downward between lateral spines; nasal, sharp; frontal, blunt; lacrymal, 3 or more, sharp; on eyeball, 5 to 7, low, blunt, in single row; occipital pit transverse, very shallow; gill membranes united, joined to isthmus with slight free fold posteriorly. Fins: dorsal (2), V to VIII—5 to 8, small, weak; anal, 6 to 8, origin below insertion of spinous dorsal fin; pelvic, I, 2, thoracic; pectoral, broad, lower rays exserted; caudal, rounded. Lateral line: high anteriorly, sharply decurved, then straight. Plates: on body, spinous; on anterior of ventrolateral series, spines

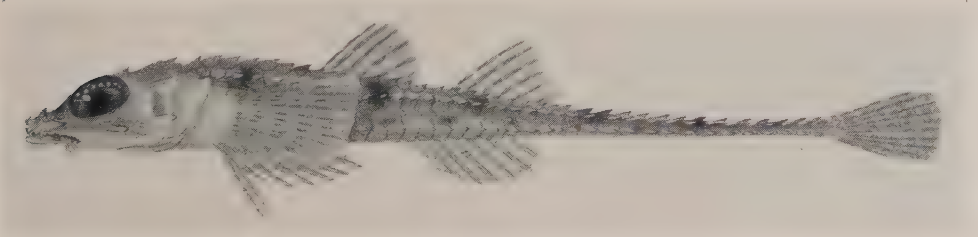

FIGURE 213. Spiny-cheeked star-snout. *Asterotheca infraspinata* (Gilbert) 1904

short, strong; on lower lateral series, spines strong, anterior five or six only smooth. Pores: on lateral line, 37 to 39. Cirri: at posterior tip of maxillary, 2, large; near anterior tips of dentaries, 2, small. Colour: light olive green to light brown on dorsal surface; white on ventral surface; dark brown saddle-like markings in series of five or six across back and sides; dark brown bars on pectoral, dorsal and caudal fins; white on pelvic and anal fins.

Length to 4½ inches.

Distinguished by the erect movable many-spined rostral plate, the spines on the lacrymal bones and the anal fin origin below the insertion of the spinous dorsal fin.

The spiny-cheeked star-snout was first taken in British Columbia waters September 19, 1913, at Nanoose bay and the specimen is now in the fish collection of the Pacific Biological Station. It has also been obtained off the west coast of Vancouver island, at Porlier pass, Boat harbour and Burrard inlet. The depths range from 10 to 30 fathoms.

Range Washington to northwestern Alaska.

Smooth sea-poacher *Anoplagonus inermis* (Günther) 1860

Body elongate, slender, depressed anteriorly. Head depressed, broad; mouth terminal, very small; jaws about equal; snout roundly pointed; rostral plate, small; spines: on upper tip of operculum in patch, small, conical; gill membranes narrowly joined to isthmus with free fold posteriorly. Fins: dorsal (1), 5 or 6; anal, 4 or 5, origin below that of dorsal fin; pelvic, I, 2, thoracic; pectoral, small; caudal, rounded. Lateral line: high anteriorly, decurved, then straight. Plates: on body, without spines. Pores: on lateral line, 41 to 44. Cirri: absent. Colour: brown on dorsal surface; brownish gray on ventral surface; black band from mouth across cheek to pectoral fin, continuing, with interruptions, along body; dusky mottling and spotting on posterior half of dorsal fin; dark brown bars on pectoral, dorsal and caudal fins; brown spots minute on anal fin; white on pelvic fins; white band near base of each pectoral fin; semi-translucent patches near base of caudal fin, 2.

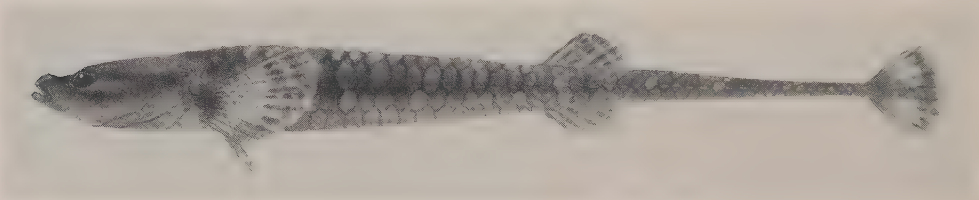

FIGURE 214. Smooth sea-poacher. *Anoplagonus inermis* (Günther) 1860

Length to 5 inches.

Distinguished by the slender body covered with smooth plates, the single rayed dorsal fin immediately above the anal fin and the two light patches on the caudal fin.

The smooth sea-poacher was first taken in British Columbia waters near Victoria by H.M.S. *Plumper*. The single specimen obtained was 32½ lines (2 7/10 inches), in length, was described in 1860 by A. Günther as the type of a new genus and species, *Aspidophoroides inermis*, and deposited in the British Museum. The smooth sea-poacher has since been secured in Nanoose bay and is common in English bay and Burrard inlet. It is taken by shrimp trawls near and on rocky bottoms at depths between 15 and 30 fathoms.

Range Washington to northwestern Alaska.

Family CYCLOPTERIDAE Lump-suckers

In the lump-suckers the body is short and stout with a thick skin in which usually are embedded plates with spines or tubercles. The dorsal fins are usually two, short, the first spinous and the second rayed, the spinous dorsal is sometimes absent; the anal fin is short; the rayed dorsal and anal fins are separate from the caudal; the pelvic fins are thoracic and modified to form an adhesive disk.

The lump-suckers are fishes of the colder northern seas, mostly of Arctic distribution. Because of their body form they are slow-moving and attach themselves to rocks, frequently in currents. The food consists of worms, crustaceans and even small fishes. Their eggs are deposited in masses among rocks and guarded by the male until hatched.

The species are fairly numerous and at least one reaches a length of 23 inches.

Spiny lump-sucker *Eumicrotremus orbis* (Günther) 1861

Body, short, deep, stout anteriorly, compressed posteriorly. Head globular, bluntly rounded; mouth terminal, small; snout broad, profile steep; nostrils paired, tubular; interorbital space flat, broad; opercular opening small, above base of pectoral fin. Fins: dorsal (2), VI or VII—9 to 11; anal, 8 to 11; pelvic, thoracic, modified into large adhesive disk with fringed thickened margin; caudal, truncate to rounded. Lateral line: absent. Scales: in form of spinous conical tubercles of various sizes, scattered on body, head and spinous dorsal fin. Cirri: in series below and behind lower jaw. Colour: light to dark green, sometimes light brown, on dorsal surface; light brown or plum on ventral surface; lavender on lips.

Length to 5 inches.

Distinguished by the short body and globular head, the conical spinous tubercles and the adhesive pelvic disk with the thickened fringed margin.

The spiny lump-sucker was first taken in British Columbia waters at Esquimalt by H.M.S. *Plumper* and presented to the British Museum by Lord John Russell. It was a small specimen, 22 lines in length (1 5/6 inches), and was described in 1861 by A. Günther as the type of a new species, *Cyclopterus orbis*.

The species was recorded by Ashdown Green as *Cyclopterus spinosus* and by Bean and Weed as *Eumicrotremus spinosus* (Müller), thus considering the Pacific and Atlantic species identical. The spiny lump-sucker is taken frequently in shrimp trawls in Burrard inlet and English bay in rocky localities. It has also been obtained at low tide in the Nanaimo area, in Wickaninnish bay north of Ucluelet, around the Queen Charlotte islands and in Nass harbour. Three individuals from Alaska were secured from the stomach of a handsaw-fish, *Alepidosaurus aesculapius*. These lump-suckers have frequently been observed attached to rocks in fast-moving tidal waters at extremely low tide and they have been recorded from a depth of 80 fathoms.

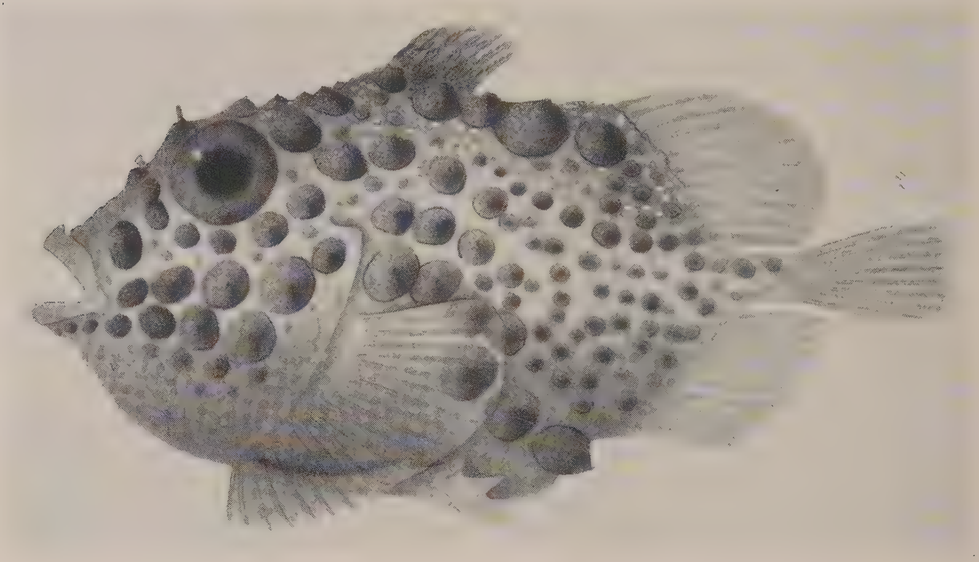

FIGURE 215. Spiny lump-sucker. *Eumicrotremus orbis* (Günther) 1861

Range Puget sound to northwestern Alaska.

Family LIPARIDAE Liparids

In the liparids the body is elongate, usually with thin loose skin and usually without scales. The dorsal fin is long, the anterior portion of which is supported by very weak spines, which are not countable without dissection, and the posterior portion supported by rays; the spines and rays are not distinguished herein and are recorded as rays; the anal fin is long; the dorsal and anal fins usually reach to or extend onto the caudal fin; the pelvic fins, when present, are thoracic and modified to form an adhesive disk.

The species range from shallow intertidal waters to depths as great as 2,000 fathoms. In the shallow-water group the eye is small, the gill opening is long, the disk is large and thoracic, the anus is slightly in advance of the anal fin and the colours are shades of brown variously marked with stripes and mottlings. In the deep-water group the eye is large, the gill opening is short, the disk is progressively more anterior and smaller and in some species is absent, and the anus moves forward, corresponding to the advance of the disk, until in some species the disk disappears and the anus is so far advanced in position as to be located below the vertical from the eyes.

In the very deep-water species the skin is very thin, loose and translucent to transparent, white to pale pink in colour, while the flesh is pink to jet black. Although *Nectoliparis pelagicus* has previously been considered to belong to the deep-water fauna, specimens have been taken in waters where the bottom is less than 40 fathoms.

The liparids are widely distributed in the colder north temperate waters and the Arctic and Antarctic seas.

Approximately thirteen genera and over one hundred and fifteen species are known.

Ring-tailed liparid *Liparis rutteri* (Gilbert and Snyder) 1898

Body elongate, terete anteriorly, compressed posteriorly. Head depressed, broad; mouth terminal, small; lower jaw included; teeth trilobed; snout bluntly rounded; nostril double; eye diameter 6 to 7 in length of head; gill opening entirely above base of pectoral fin. Skin: very loose. Fins: dorsal (1), 30 to 32, low, lobed anteriorly, just reaching base of caudal fin; anal, 23 to 27, extending onto caudal fin about one-fifth to one-sixth length of caudal fin; pelvic adhesive disk, thoracic, nearly circular, margin thickened, length 1.4 to 1.8 in length of head, posterior margin behind vertical from gill opening; pectoral, 30 to 33, lobed, lower rays slightly exserted; caudal, truncate to rounded. Lateral line: absent. Scales: absent. Pyloric caeca: 23 to 31. Colour: jet black to bluish slate or brown; white band across base of caudal fin extending to posterior tips of dorsal and anal fins; somewhat white sometimes on margins of dorsal, pectoral and anal fins; light brown irregular longitudinal stripes sometimes present.

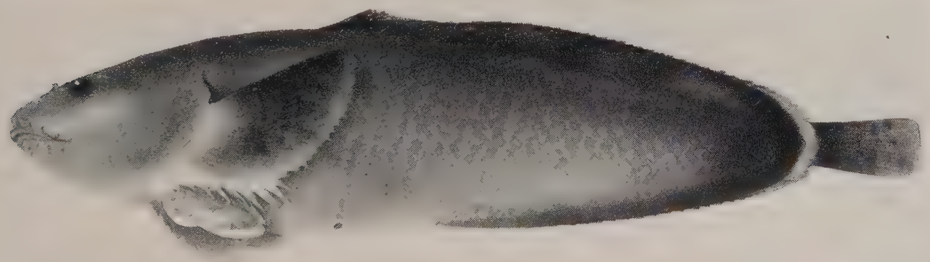

FIGURE 216. Ring-tailed liparid. *Liparis rutteri* (Gilbert and Snyder) 1898

Length to 4½ inches.

Distinguished by the small gill openings above the pectoral fins, the white band across the base of the caudal fin and the large adhesive pelvic disk.

The ring-tailed liparid was first taken in British Columbia waters in July, 1909, at Ucluelet by Messrs. C. H. Young and W. Spreadborough. Twelve specimens were secured up to 2½ inches in length, and recorded in 1920 by B. A. Bean and A. C. Weed as *Neoliparis rutteri* Gilbert and Snyder. In February, 1934, five specimens were obtained in Burrard inlet at a depth between 10 and 12 fathoms, and December 10, 1940, a single individual was secured in English bay in a shrimp trawl at a depth between 30 and 40 fathoms. It is a moderately shallow-water species.

Range Oregon to northwestern Alaska.

Pallas's liparid *Liparis callyodon* (Pallas) 1811

Body elongate, stout anteriorly, compressed posteriorly. Head somewhat depressed; mouth terminal, small; lower jaw included; teeth trilobed; snout bluntly rounded; nostril double; eye diameter 6 to 7 in length of head; gill opening above pectoral fin, or at most not below first ray of pectoral fin. Skin: loose. Fins: dorsal (1), 33 to 35, lobed anteriorly, just reaching base of caudal fin; anal, 25 to 27, extending onto caudal fin less than one-fifth length of caudal fin; pelvic adhesive disk thoracic, nearly circular, margin thickened, length 2.2 to 3 in length of head, posterior margin behind vertical from gill opening; pectoral, 28 to 31, lobed, lower rays slightly exserted; caudal, truncate to rounded. Lateral line: absent. Scales: absent. Pyloric caeca: 42 to 66. Colour: olive brown on body and fins, spotted with larger areas about size of pupil; dusky on chin; dark spots on rays of dorsal, anal and caudal fins forming bands.

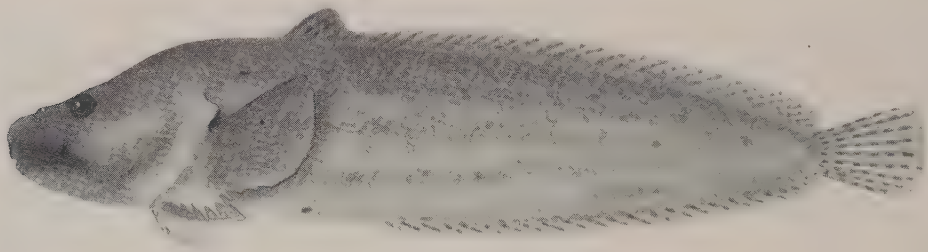

FIGURE 217. Pallas's liparid. *Liparis callyodon* (Pallas) 1811

Length to 5 inches.

Distinguished by the lobe in the dorsal fin, the very small gill openings and the dark spotting on the rays of the dorsal, anal and caudal fins.

Pallas's liparid was first taken in British Columbia waters in 1885 in Johnstone strait, Discovery passage, by Dr. G. M. Dawson and the three specimens were recorded in 1920 by B. A. Bean and A. C. Weed as *Neoliparis callyodon* (Pallas). Other records are from the strait of Georgia and the Queen Charlotte islands. This is a shore species frequently found in tide-pools.

Range Washington to northwestern Alaska.

Shore liparid *Liparis florae* (Jordan and Starks) 1895

Body elongate, stout anteriorly, compressed posteriorly; greatest depth slightly behind origin of anal fin. Head depressed; mouth terminal, small; lower jaw included; teeth trilobed; snout bluntly rounded; nostril double; eye diameter 6 to 7 in length of head; gill opening extending downward to between third and fifth rays of pectoral fin. Skin: loose. Fins: dorsal (1), 31 to 33, lobed anteriorly, scarcely reaching caudal fin; anal, 25 to 27, scarcely reaching caudal fin; pelvic adhesive disk thoracic, slightly longer than wide, margin thickened, length 2 to 2.4 in length of head, posterior margin behind vertical from gill opening; pectoral, 29 to 33, lobed; lower rays slightly exserted; caudal, truncate to rounded. Lateral line: absent. Scales: absent. Pyloric caeca: 70 or fewer. Colour: uniform dark brown, varying from olive green to dusky purple.

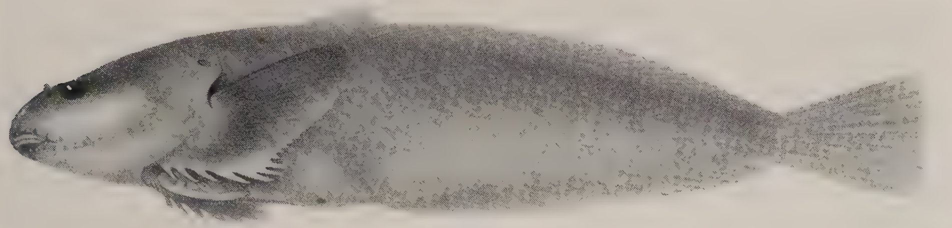

FIGURE 218. Shore liparid. *Liparis florae* (Jordan and Starks) 1895

Length to 5 inches.

Distinguished by the greatest depth of the body slightly behind the origin of the anal fin, the oval adhesive disk and the gill openings extending downward to between the third and fifth rays of the pectoral fins.

The shore liparid was first taken in British Columbia waters May 30, 1934, at False narrows, by Dr. W. A. Clemens and the specimen is now in the fish collection of the Pacific Biological Station. Other records are from Burrard inlet and the west coast of Vancouver island as far north as Esperanza inlet. This is a shore species whose coloration varies with the environment.

Range northern California to Esperanza inlet.

Günther's liparid *Liparis cyclopus* Günther 1861

Body elongate, stout anteriorly, compressed posteriorly; greatest depth behind posterior margin of disk. Head depressed; mouth terminal, small; lower jaw included; teeth trilobed; snout bluntly rounded; nostril double; eye diameter 5 to 6.2 in length of head; gill opening extending downward to between fifth and tenth rays of pectoral fin. Skin: moderately firm. Fins: dorsal (1), 35 to 37, not lobed, extending onto caudal fin less than one-fifth length of caudal fin; anal, 29 to 31, extending onto caudal fin less than one-fifth length of caudal fin; pelvic adhesive disk thoracic, circular, margin thickened, length 2 to 2.5 in length of head, posterior margin behind vertical from gill opening; pectoral, 29 to 32, lobed, lower rays much exserted; caudal, truncate to rounded. Lateral line: absent. Scales: absent. Pyloric caeca: 32 to 39. Colour: olivaceous, speckled with olive brown on body and fins; brown longitudinal stripes on body in some specimens.

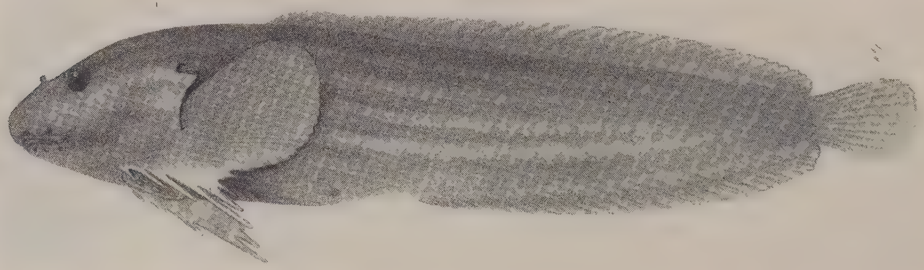

FIGURE 219. Günther's liparid. *Liparis cyclopus* Günther 1861

Length to 4½ inches.

Distinguished by the entire dorsal fin extending onto the caudal fin for less than one-fifth length of caudal fin, the gill openings extending downward to between the fifth and tenth rays of the pectoral fins and the circular pelvic adhesive disk.

Günther's liparid was first taken in British Columbia waters in Esquimalt harbour by H.M.S. *Plumper* and presented to the British Museum by Lord John Russell. This specimen was used by Dr. A. Günther as the type and it was recorded as such in 1861. Other specimens have been secured in Juan de Fuca strait and in the Queen Charlotte islands in Massett and Skidegate inlets. The only depth recorded in these instances was 100 fathoms in Juan de Fuca strait.

Range Puget sound to northwestern Alaska.

Juan de Fuca liparid *Liparis fucensis* Gilbert 1895

Body elongate, stout anteriorly, compressed posteriorly. Head depressed; mouth terminal, small; lower jaw included; teeth trilobed; snout bluntly rounded; nostril double; eye diameter 5 to 6.5 in length of head; gill opening extending downward to point between twelfth and sixteenth rays of pectoral fin. Skin: thin, loose. Fins: dorsal (1), 33 to 35, lobed anteriorly, extending onto caudal fin less than one-fifth length of caudal fin; anal, 27 to 29, extending onto caudal fin less than one-fifth length of caudal fin; pelvic adhesive disk thoracic, circular, margin thickened, length 2 to 3 in length of head, posterior margin behind vertical from gill opening; pectoral, 37 to 43, lobed, lower rays greatly exserted, usually extending behind anus; caudal, truncate to rounded. Lateral line: absent. Scales: absent. Pyloric caeca: 55 or fewer. Colour: olive brown to blackish brown, frequently tinged with pink, variously mottled or striped; dusky on fins; red, brown and black bars on pectoral and caudal fins.

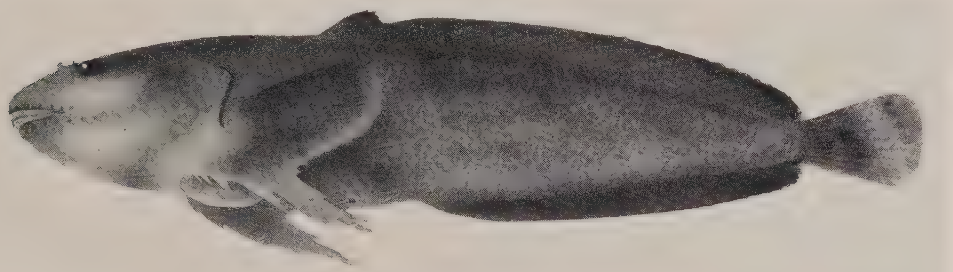

FIGURE 220. Juan de Fuca liparid. *Liparis fucensis* Gilbert 1895

Length to 7 inches.

Distinguished by the diameter of the eye 5 to 6.5 in the length of the head, the anal fin extending onto the caudal fin for less than one-fifth of the length of the caudal fin and the gill openings extending downward to between the twelfth and sixteenth rays of the pectoral fins.

The Juan de Fuca liparid was first taken in British Columbia waters August 27, 1891, in Juan de Fuca strait by the *Albatross*, station 3445, lat. 48° 16′ N., long. 123° 45′ W., depth 100 fathoms and recorded in 1895 by C. H. Gilbert. Since then it has been found in English bay, Burrard inlet, Lowe inlet and on Moresby island at Kaisun bay. It ranges from shallow water to 212 fathoms. The food consists in part of crustaceans.

Range northern California to southeastern Alaska.

Denny's liparid *Liparis dennyi* Jordan and Starks 1895

Body elongate, stout anteriorly, compressed posteriorly. Head moderately depressed; mouth terminal, small; lower jaw included; teeth trilobed; snout bluntly rounded; nostril double; eye diameter 7 to 7.5 in length of head; gill opening extending downward to point between tenth and fifteenth rays of pectoral fin. Skin: thin, loose. Fins: dorsal (1), 37 to 40, slightly lobed anteriorly (lobe usually absent in large individuals), extending onto caudal fin for about one-fifth length of caudal fin; anal, 30 to 34, extending onto caudal for about two-fifths length of caudal fin; pelvic adhesive disk thoracic, almost circular, margin thickened, length 2.2 to 2.4 in length of head, posterior margin behind vertical from gill opening; pectoral, 36 to 39, lower rays much exserted, usually not extending to anus; caudal, truncate to rounded. Lateral line: absent. Scales: absent. Pyloric caeca: 19 to 31. Colour: olive to dark brown or black, with wavy stripes and mottlings or with white dots.

Length to 12 inches.

Distinguished by the diameter of the eye 7 to 7.5 in the length of the head, the anal fin extending onto the caudal fin for about two-fifths of the length of the caudal fin and the gill openings extending downward to a point between the tenth and the fifteenth rays of the pectoral fins.

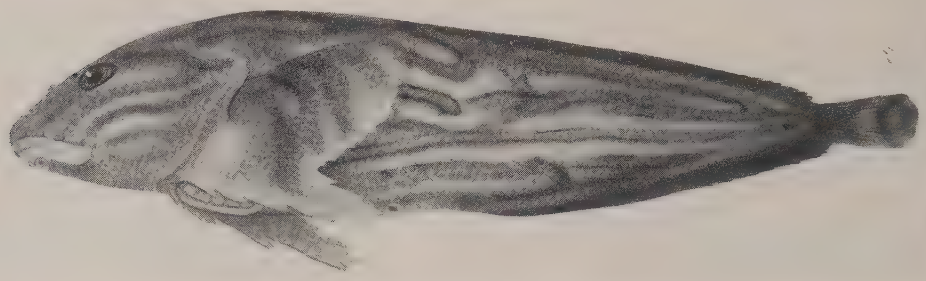

FIGURE 221. Denny's liparid. *Liparis dennyi* Jordan and Starks 1895

Denny's liparid was first taken in British Columbia waters August 27, 1891, in Juan de Fuca strait off Race rocks by the *Albatross*, station 3445, lat. 48° 16′ N., long. 123° 45′ W., depth 100 fathoms, and in the following month at four stations around the southern end of Vancouver island at depths from 48 to 123 fathoms. These were recorded in 1895 by C. H. Gilbert. On January 17, 1934, two 6-inch specimens were secured by trawling in Active pass at a depth of 40 fathoms. These contained mature eggs, faintly pink in colour, which flowed freely from the body. Other individuals have been obtained in English bay and Burrard inlet in shrimp trawls at depths between 10 and 20 fathoms. The food consists in part of crustaceans.

Range Puget sound to northwestern Alaska.

Continuous-finned liparid *Liparis pulchellus* Ayres 1855

Body elongate, compressed. Head depressed, broad; mouth subterminal, small; lower jaw included; teeth trilobed; snout bluntly rounded to truncate; nostril double; eye diameter 4.5 to 5.4 in length of head; interorbital space broad; gill opening above pectoral fin or not extending downward below fourth ray. Skin: thin, loose. Fins: dorsal (1), 47 to 53, without lobe; anal, 39 to 41; both dorsal and anal connected to caudal more than four-fifths length of caudal fin; pelvic adhesive disk thoracic, circular, margin thickened, length 2.3 to 2.4 in length of head, posterior margin behind vertical from gill openings; pectoral, 36 or 37, lower rays slightly exserted; caudal, truncate. Lateral line: absent. Scales: absent. Pyloric caeca: about 32. Colour: light to dark brown on dorsal surface; lighter on ventral surface; dots or wavy longitudinal dark lines sometimes present; black on dorsal, anal and caudal fins, or light brown with oblique black bars, especially pronounced in young; usually barred on pectoral fins.

Length to 10 inches.

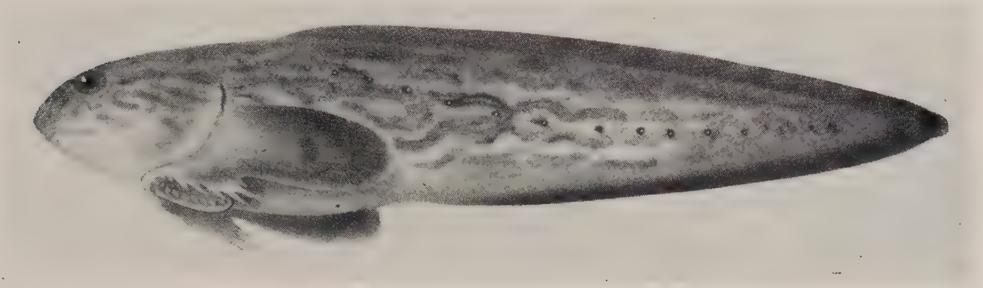

FIGURE 222. Continuous-finned liparid. *Liparis pulchellus* Ayres 1855

Distinguished by the extremely long connection of the dorsal and anal fins with the caudal fin, the broad head with the eyes widely spaced and the subinferior mouth.

The continuous-finned liparid was first taken in British Columbia waters in 1885 by Dr. G. M. Dawson in Queen Charlotte sound at a depth of 30 fathoms and recorded in 1887 by J. F. Whiteaves as *Liparis pulchella* Ayres. It occurs along the whole coast and apparently is rather common in the strait of Georgia, in English bay, Burrard inlet, Departure and Nanoose bays. It is obtained in shrimp trawls at depths of 10 to 50 fathoms as well as in shore seines.

Range northern California to northwestern Alaska.

Green's liparid *Polypera greeni* (Jordan and Starks) 1895

Body elongate, little compressed. Head somewhat depressed, broad; mouth terminal, small; lower jaw included; teeth simple and trilobed; snout bluntly rounded; nostril double; eye diameter about 10 in length of head; gill opening above pectoral fin or not extending downward below fourth ray. Skin: thin, loose. Fins: dorsal (1), 37 to 40, lobed anteriorly, extending onto caudal fin for less than one-fifth length of caudal fin; anal, 31 or 32, barely reaching caudal fin; pelvic adhesive disk thoracic, nearly circular, margin thickened, length 2.3 to 2.8 in length of head, posterior margin below or slightly anterior to vertical from gill opening; pectoral, 33 to 37, lower rays much exserted; caudal, truncate to rounded. Lateral line: absent. Scales: absent. Pyloric caeca: more than 300. Colour: light brown to bluish black on dorsal surface; cream to light brown on ventral surface.

Length to 12 inches.

Distinguished by the small eyes, the posterior margin of the pelvic adhesive disk placed below or slightly anterior to the vertical from the gill openings, the lobed dorsal fin, the short gill openings not extending below the upper four rays of the pectoral fins and the large number of pyloric caeca.

Green's liparid was first taken in British Columbia waters in 1895, in Esquimalt harbour, by Mr. Ashdown Green and recorded in the same year by D. S. Jordan and E. C. Starks as the type of a new species, *Neoliparis greeni*, in honour of its discoverer and first British Columbia ichthyologist, Mr. Ashdown Green. The specimen was deposited in the Provincial Museum at Victoria. A second specimen, 12 inches in length, was captured December 19, 1944, in Porlier pass in a herring seine by Capt. J. McGinnis. This individual is now in the fish collection of the University of British Columbia.

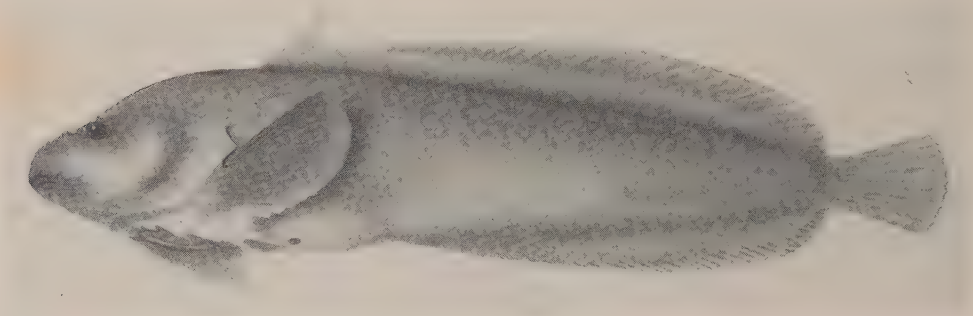

FIGURE 223. Green's liparid. *Polypera greeni* (Jordan and Starks) 1895

Range Puget sound to northwestern Alaska.

Abyssal liparid *Careproctus ovigerum* (Gilbert) 1895

Body elongate, greatest depth anterior to origin of dorsal fin, compressed. Head large, deep, broad; mouth terminal, moderate; lower jaw included; teeth simple, slender; snout bluntly rounded; nostril single; eye diameter 6 or 7 in length of head; gill opening extending downward to about eighth ray of pectoral fin. Anus near posterior margin of pelvic disk. Skin: thin, loose. Fins: dorsal (1), 43, high, extending onto caudal fin for about two-fifths length of caudal fin; anal, 34, extending onto caudal fin for about two-fifths length of caudal fin; pelvic adhesive disk thoracic, nearly circular, margin thickened, large, length 2.9 in length of head, posterior margin anterior to vertical from gill openings; pectoral, 34, lower rays much exserted; caudal, narrow, pointed. Lateral line: absent. Scales: absent. Pyloric caeca: 19. Colour: pale, dusted with light brown.

Length to 12½ inches.

Distinguished by the high dorsal fin, the single nostrils, the gill openings extending downward to the upper eight rays of the pectoral fins and the anterior position of the pelvic adhesive disk.

The abyssal liparid was first taken in British Columbia waters September 3, 1890, west of Moresby island, by the *Albatross*, station 3342, lat. 52° 39′ N., long. 132° 38′ W., depth 1,588 fathoms, recorded in 1895 by C. H. Gilbert as the type of a new genus and species, *Bathyphasma ovigerum* and deposited in the United States National Museum. This is the only known specimen, a male. The name *ovigerum*, meaning "egg-bearing", was given because the fish when captured contained a mass of eggs in its mouth.

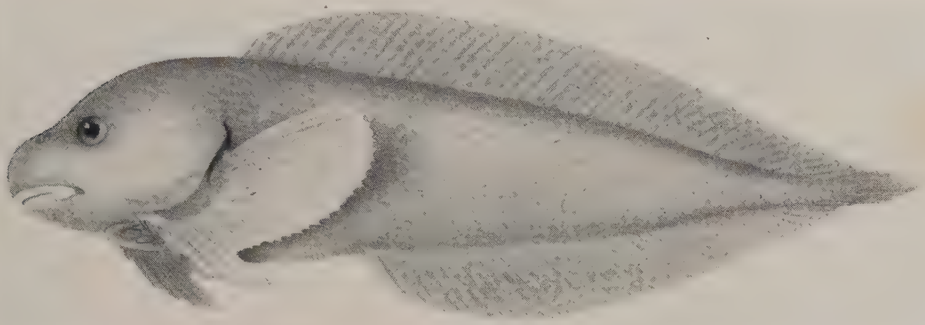

FIGURE 224. Abyssal liparid. *Careproctus ovigerum* (Gilbert) 1895

Range near the Queen Charlotte islands.

Small-disked liparid *Careproctus gilberti* Burke 1912

Body elongate, greatest depth at origin of dorsal fin, compressed. Head large, deep, compressed; mouth terminal, moderate; lower jaw included; teeth simple, few with lateral lobes; snout bluntly rounded; eye large, diameter about 3.5 in length of head; gill opening extending downward to about fourteenth ray of pectoral fin. Anus near posterior margin of pelvic disk. Skin: very thin, loose. Fins: dorsal (1), about 55, without lobe, extending onto caudal fin for about half length of caudal fin; anal, 46 to 48, extending onto caudal fin for about half length of caudal fin; pelvic adhesive disk thoracic, below eye, slightly wider than long, margin thickened, very small, length 7.3 to 9 in length of head; pectoral, about 31, lower rays greatly exserted, middle rays very short; caudal, truncate to rounded. Lateral line: absent. Scales: absent. Pyloric caeca: 10 to 12. Colour: creamy white to pale pink, sometimes light brown on dorsal surface; pale to dusky on fins; silvery on lower half of eye; viscera showing as dark mass.

Length to 3½ inches.

Distinguished by the very small pelvic adhesive disk vertically below the large eye, the single nostrils and the gill openings extending downward to the fourteenth rays of the pectoral fins.

The small-disked liparid was first taken in British Columbia waters August 31, 1888, off Fort Rupert by the *Albatross*, station 2862, lat. 50° 49′ N., long. 127° 36′ W., depth 238 fathoms, and recorded in 1930 by C. V. Burke. It has not been recorded since in these waters. This is a deep-water species ranging between 102 and 482 fathoms.

Range northern end of Vancouver island to southeastern Alaska.

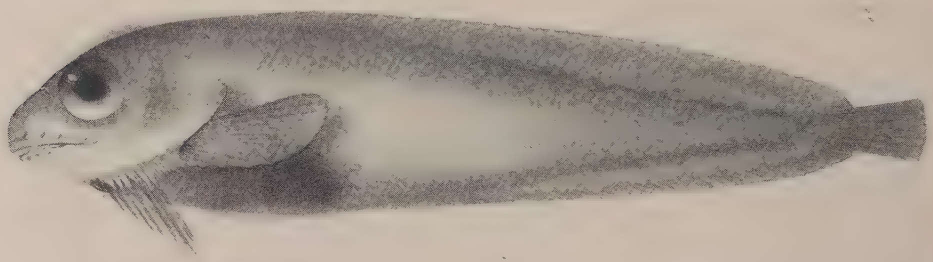

FIGURE 225. Small-disked liparid. *Careproctus gilberti* Burke 1912

Black-tailed liparid *Careproctus melanurus* Gilbert 1891

Body elongate, greatest depth at origin of dorsal fin, compressed. Head short, compressed; mouth terminal, small; lower jaw included; teeth simple, few with lateral lobes; snout bluntly rounded; nostril single; eye moderately large, diameter 3.5 to 4 in length of head; gill opening entirely above pectoral fin. Anus near posterior margin of pelvic disk. Skin: very thin, loose. Fins: dorsal (1), 54 to 58, without lobe, extending onto caudal fin for half length of caudal fin; anal, 47 to 50, extending onto caudal fin for half length of caudal fin; pelvic adhesive disk thoracic, below eye, nearly circular, margin thickened, very small, length 6.4 to 6.9 in length of head; pectoral, 30 or 31, lower rays very slightly

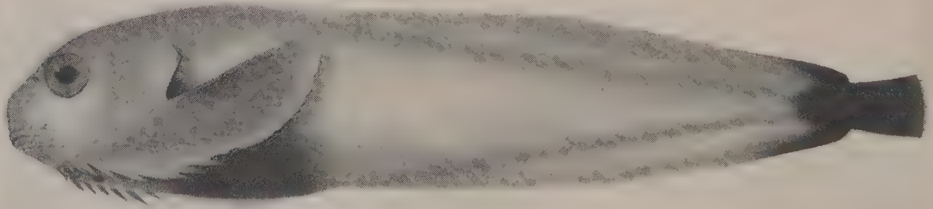

FIGURE 226. Black-tailed liparid. *Careproctus melanurus* Gilbert 1891

exserted, thickened; caudal, truncate to rounded. Lateral line: absent. Scales: absent. Pyloric caeca: 20 to 27. Colour: white to pale rose red on body and portions of pectoral, dorsal and anal fins; dusky on abdomen; black on caudal fin, on posterior portions of dorsal and anal fins, on inner surface of pectoral fins, inside of mouth and gill openings.

Length to 9 inches.

Distinguished by the very small pelvic adhesive disk vertically below the eye, the single nostrils and the gill openings entirely above the pectoral fins.

The black-tailed liparid was first taken in British Columbia waters August 29, 1888, between the northern end of Vancouver island and the southern end of the Queen Charlotte islands by the *Albatross*, station 2860, lat. 51° 23′ N., long. 130° 34′ W., depth 876 fathoms and recorded in 1930 by C. V. Burke. This is the only record from these waters.

Range southern California to northern British Columbia.

Prickly liparid *Paraliparis deani* Burke 1912

Body elongate, greatest depth at origin of dorsal fin, very slender posteriorly, attenuate, compressed. Head short, deep, compressed; mouth terminal, small; lower jaw included; teeth simple, few with slight lateral lobes, on both jaws in bands; snout bluntly rounded; nostril single; eye moderately large, diameter 3 to 4.5 in length of head; gill opening extending downward to point between tenth and thirteenth rays of pectoral fin. Anus below vertical from gill opening, opening downward; genital opening immediately posterior to anus. Skin: very thin, loose. Fins: dorsal (1), 56 to 59, without lobe, extending onto caudal fin for half length of caudal fin; anal, 44 to 49, extending onto caudal fin for half length of caudal fin; pelvic fins (adhesive disk), absent; pectoral, 18 to 21, lower rays greatly exserted, middle rays short; caudal, 6, slender, truncate. Lateral line: absent. Scales: in form of minute "thumb-tack" prickles on lower portion of pectoral fins. Pyloric caeca: about 9. Colour: white to opaque on dorsal surface; silvery on

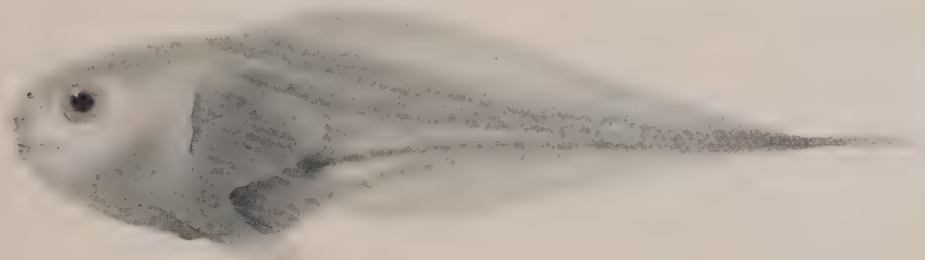

FIGURE 227. Prickly liparid. *Paraliparis deani* Burke 1912

ventral surface, translucent; pale pinkish red on lips and fins; dusky to black on peritoneum.

Length to 3 5/8 inches.

Distinguished by the attenuated posterior portion of the body, the absence of a pelvic disk, the anus opening downward and the extremely minute prickles on the greatly exserted lower rays of the pectoral fins.

The prickly liparid was first taken in British Columbia waters June 20, 1903, in the strait of Georgia by the *Albatross*, station 4194, lat. 49° 19′ N., long. 123° 43′ W., depth 111 fathoms, and recorded in 1907 as *Paraliparis holomelas* Gilbert by B. W. Evermann and E. L. Goldsborough. *P. deani* was described as a new species in 1912 and the specimen mentioned above, upon re-examination, was found to be the new species and was recorded in 1930 by C. V. Burke. The prickly liparid also was obtained off Fort Rupert by the *Albatross*, station 4203, in 36 fathoms. Twenty-five specimens were secured in February, 1934, in English bay at depths between 50 and 70 fathoms in shrimp trawls. In May, 1936, one male and three females were obtained in English bay at 35 fathoms. The females contained what appeared to be fully mature eggs 2 mm. in diameter.

Range northern California to northwestern Alaska.

Tadpole liparid *Nectoliparis pelagicus* Gilbert and Burke 1912

Body elongate, greatest depth at origin of dorsal fin, slender posteriorly, attenuate, compressed. Head short, deep, moderately compressed; mouth terminal, small; lower jaw included; teeth minute, simple, on lower jaw only, in single row; snout bluntly rounded; nostril single; eye large, diameter 2.4 to 2.7 in length of head; gill opening entirely in front of pectoral fin, extending from first to fourteenth ray. Anus below vertical from eyes, in deep dorsally flattened groove, pointing forward; genital pore ventral to anus, pointing forward; anal papilla ventral to genital pore, pointing downward. Skin: very thin, loose. Fins: dorsal (1), about 53, without lobe, extending onto caudal fin for half length of caudal fin; anal, about 48, extending onto caudal fin for half length of caudal fin; pelvic fins (adhesive disk), absent; pectoral, 18 to 21, in two wholly distinct

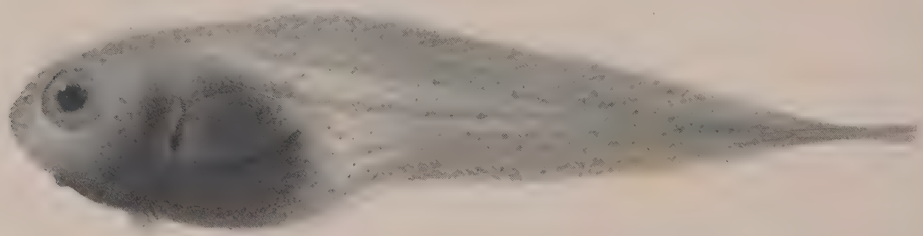

FIGURE 228. Tadpole liparid. *Nectoliparis pelagicus* Gilbert and Burke 1912

lobes, rays in upper lobe, 13 or 14, well developed, in lower lobe, 3 or 4, greatly exserted, in portion between lobes, rays 2 or 3 sometimes developed, very short; caudal, 6, slender, truncate. Lateral line: absent. Scales: absent. Pyloric caeca: about 8. Colour: pale, silvery on body beneath loose transparent skin; dark area on cheek; dark spots scattered over head and posterior part of body, small, irregularly shaped; dark on lining of mouth and gill cavity; jet black on peritoneum.

Length to 2½ inches.

Distinguished by the tadpole shape, the absence of a pelvic disk, the gill openings entirely in front of the pectoral fins, the forwardly-projecting anus located in a groove at a point below the eyes and the widely separated lobes of the pectoral fins.

The tadpole liparid was first taken in British Columbia waters April 20, 1933, in Sechelt inlet at Narrows arm, by Dr. N. M. Carter, at a depth of 130 fathoms in a grab dredge. The bottom consisted of green mud and debris, chiefly leaves and twigs, from which came a strong odour of hydrogen sulphide. The bottom water was stagnant and practically devoid of oxygen. Previous records of this fish from American waters give a depth range of 300 to 633 fathoms. In 1936, however, two specimens were obtained in English bay from a shrimp trawl at a depth of 35 fathoms and in 1940 another from the same area at a depth between 30 and 40 fathoms.

Range southern California to northwestern Alaska.

Order HETEROSOMATA

In this order the body is greatly compressed, somewhat rounded on the eyed side, flat on the blind side. In the adult flat-fishes both eyes are on one side of the head. The scales are cycloid or ctenoid, or both. The fins are all composed of soft rays with one exception (*Psettodes*, in tropical waters); the dorsal and anal fins are long; the pelvic fins are thoracic, usually with 6 rays, occasionally with 5; the pelvic girdle is directly attached to the cleithra.

In the young flat-fishes the body is upright and symmetrical with an eye on each side of the head. Very soon a metamorphosis takes place, during which one eye migrates to the opposite side of the head, so that eventually both eyes are on the upper, or darker-coloured, side. The fish then settle to the bottom and swim horizontally. Although the flat-fishes are a very specialized group they have certain characters which indicate a relationship with the Percomorphi.

Flat-fishes have the remarkable ability of being able to change their shades and colour patterns to blend with the immediate surroundings. This is effected by controlling the contraction and expansion of the chromatophores of various colours.

The order comprises five families, of which two are represented in British Columbia waters.

In the sand dabs the body is left-handed (sinistral), that is, the eyes and coloured surface are on the left side of the fish. The pelvic fin of the eyed side is exactly on the edge of the abdominal ridge.

The term sand dab is here applied to the members of the family Bothidae only.

Mottled sand dab *Citharichthys sordidus* (Girard) 1854

Body elongate, moderately slender, much compressed, sinistral. Head deep; mouth terminal, moderate; lower jaw projecting; snout rounded; diameter of lower eye longer than length of snout; interorbital space moderate, concave; ridge above lower eye high, sharp, bony, naked. Fins: dorsal (1), 86 to 102; anal, 67 to 81; pelvic, 6, thoracic, that of eyed side on edge of abdominal ridge; caudal, truncate to rounded. Lateral line: nearly straight. Scales: imbricated, rather thin, deciduous, cycloid on both sides of body; on lateral line, 61 to 70. Colour: dull brown on eyed side, irregularly mottled with black; soiled white to light brown on blind side; black on dorsal, anal and caudal fins; dull orange spots and blotches on males in life; in young, light olive green on eyed side, finely and sparsely speckled with brown, black and orange, particularly on fins.

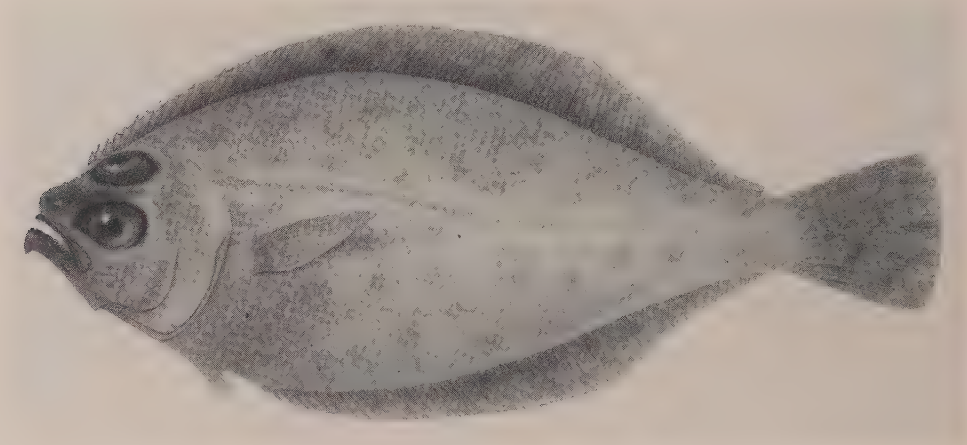

FIGURE 229. Mottled sand dab. *Citharichthys sordidus* (Girard) 1854

Length to 12 inches.

Distinguished by the mottled coloration on the eyed side of the body, the pelvic fin of the eyed side being exactly on the edge of the abdominal ridge and the 61 to 70 scales on the lateral line.

The mottled sand dab was first taken in British Columbia waters June 21, 1882, at Calvert island in Safety cove by Capt. H. E. Nichols and recorded in 1883 by T. H. Bean. It is fairly common in the strait of Georgia and has been captured off the west coast of Vancouver island, in Johnstone strait and in Milbanke sound in waters of moderate depths. At the present time this sand dab is utilized only by Orientals who split and dry it. Fishermen from the British isles sometimes refer to this fish as the megrim.

Range southern California to northwestern Alaska.

Speckled sand dab *Citharichthys stigmaeus* Jordan and Gilbert 1882

Body elongate, moderately slender, much compressed, sinistral. Head deep; mouth terminal, moderate; jaws equal; snout rounded; diameter of lower eye equal to length of snout; interorbital space narrow, flat to convex; ridge above lower eye, absent. Fins: dorsal (1), 79 to 92; anal, 59 to 72; pelvic, 6, thoracic, that of eyed side on edge of abdominal ridge; caudal, truncate to rounded. Lateral line: nearly straight. Scales: imbricated, deciduous, cycloid on both sides of body; on lateral line, 52 to 58. Colour: olive brown on eyed side, finely and sharply speckled with black; soiled white to cream on blind side; in young, on eyed side, nearly uniform gray, finely speckled with black, resembling sandy beach in coloration.

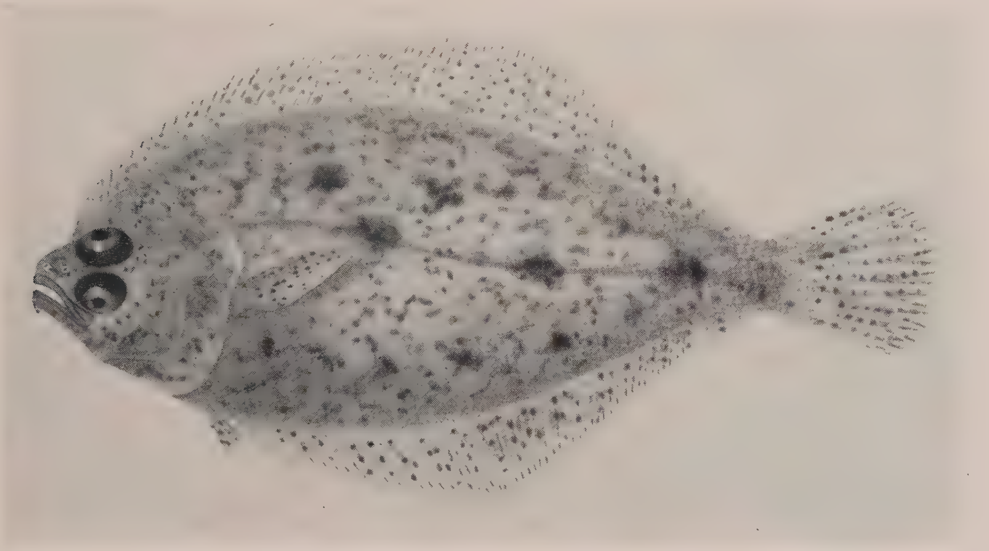

FIGURE 230. Speckled sand dab. *Citharichthys stigmaeus* Jordan and Gilbert 1882

Length to 6 inches.

Distinguished by the speckled coloration on the eyed side of the body, the pelvic fin of the eyed side being exactly on the edge of the abdominal ridge and the 52 to 58 scales on the lateral line.

The speckled sand dab was first taken in British Columbia waters in June and July, 1909, at Ucluelet by C. H. Young and W. Spreadborough when 5 specimens were obtained and were recorded in 1920 by B. A. Bean and A. C. Weed. The speckled sand dab is known from the west coast of Vancouver island and the west coast of Moresby island and is secured frequently in trawls in the strait of Georgia from shallow water to 40 fathoms. It is of little commercial importance because of its small size.

Range southern California to southeastern Alaska.

Family PLEURONECTIDAE Flounders

In the flounders the body is right-handed (dextral), that is, the eyes and coloured surface are on the right side of the fish. The pelvic fins are symmetrically arranged, one on each side of the abdominal ridge.

The family may be divided into two groups. In one, as exemplified by the halibuts and related species, the mouth is large and symmetrical, the maxillary extends to the pupil of the eye or behind and the teeth are well developed on both sides of the jaws; associated with the habit of actively pursuing fishes for food. In the other, the mouth is small and asymmetrical, the maxillary does not extend to the pupil of the eye, and the teeth are largely confined to the sides of the jaws on the unpigmented side of the head, associated with the habit of feeding upon bottom-living invertebrates and small fishes.

Although the flounders are typically dextral there is an occasional exception, as for example the starry flounder, which frequently may be sinistral, and the halibut, which occasionally is so. There are, as well, cases in which pigmentation may develop on both sides of the body. This condition is known as ambicoloration.

In regard to the common names used in referring to members of the family Pleuronectidae in western Canadian waters, there is a confusion of terminology. Early settlers from the borders of the North sea were faced with a new fauna, quite unlike that to which they were accustomed. Instead of applying new names to the new fishes they attempted to use the names of fishes which they already knew. For example, the term brill has attained common usage, although the species *Scophthalmus rhombus* does not occur in these waters, and the term sole has been applied loosely to many species, none of which are in the family Soleidae.

The common names as herein used have been selected from a list drawn up by a local committee of fishery biologists and representatives of the fishing industry in the attempt to attain uniformity of usage for market and statistical purposes.

The flounders are confined to Arctic seas.

Long-jaw flounder *Atheresthes stomias* (Jordan and Gilbert) 1880

Body rather elongate, slender, much compressed, dextral. Head elongate; mouth terminal, very large, nearly symmetrical, gape wide; maxillary extending to point behind eye; teeth well developed on both sides of jaws, arrow-shaped; snout pointed; upper eye on margin of head. Fins: dorsal (1), 93 to 115; anal, 81 to 99; pelvic, 6, thoracic; caudal, slightly lunate. Lateral line: slightly decurved, then straight, no arch or accessory branch. Scales: unevenly imbricated, rather large, irregular in size, thin; ctenoid on both sides of body; on lateral line, about 135. No spine before anal fin. Colour: brown on eyed side, darker on margins of scales; white on blind side, finely dotted with black.

Length to 2 feet 6 inches.

Distinguished by the very large jaws extending behind the eyes, the arrow-shaped teeth and the left eye on the upper margin of the head.

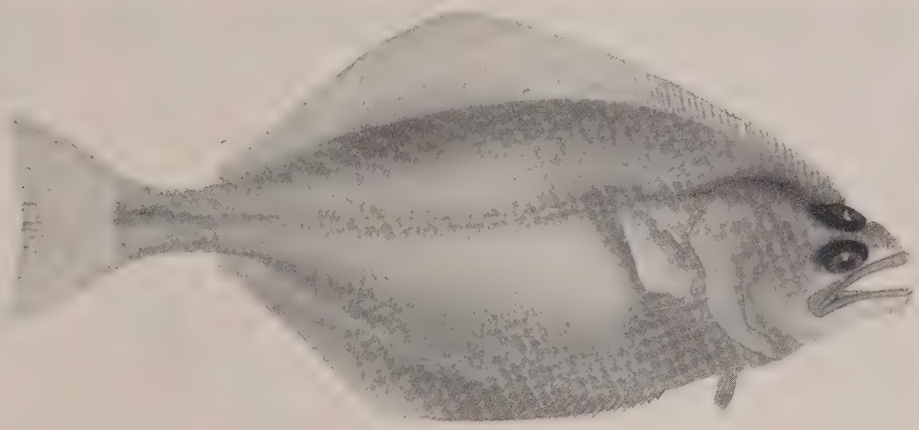

FIGURE 231. Long-jaw flounder. *Atheresthes stomias* (Jordan and Gilbert) 1880

The long-jaw flounder was first taken in British Columbia waters August 28, 1891, west of Port San Juan by the *Albatross*, station 3448, lat. 48° 31′ N., long. 124° 39′ W., depth 98 fathoms and recorded in 1895 by C. H. Gilbert. The species is common along the whole coast, especially northward, where it occurs in shallower water than to the southward. It is obtained frequently with the halibut in 10 to 100 fathoms but up to the present has been little marketed in Canada. The food consists at least in part of shrimps. Other names applied to this fish are arrow-toothed halibut and bastard halibut.

Range northern California to northwestern Alaska.

Halibut *Hippoglossus stenolepis* Schmidt 1904

Body elongate, rather slender, compressed, dextral, very rarely sinistral. Head elongate; mouth terminal, large, nearly symmetrical, gape wide; maxillary extending to point below eye; teeth well developed on both sides of jaws, conical; snout pointed; eyes large, upper eye slightly posterior to lower. Fins: dorsal (1), 89 to 109; anal, 64 to 81; pelvic, 6, thoracic; caudal, slightly lunate. Lateral line: distinctly arched over pectoral fin, no accessory branch. Scales: imbricated, very small, narrow, cycloid on both sides of body; on lateral line, 150 or more.

No spine before anal fin. Colour: dark brown on eyed side, irregularly blotched with lighter; white on blind side, rarely with dark.

Male: length to 4 feet 7 inches.

Female: length to 8 feet 9 inches.

Distinguished by the lunate caudal fin, the arched lateral line and the narrow smooth scales.

The halibut was first recorded from British Columbia waters in 1866 by J. K. Lord as "*Pleuronectes hippoglossus* of Linnaeus", on the basis of the examination of a single specimen over 300 pounds in weight. In 1891 Ashdown Green recorded the species as *Hippoglossus vulgaris*. Subsequently the species was considered identical with the Atlantic species, *Hippoglossus hippoglossus*, until P. J. Schmidt, in 1904, proposed the new specific name *stenolepis* on the basis of certain scale characters. The halibut at one time was very abundant along the whole Pacific coast of Canada, which, in fact, appeared to be the area of greatest primeval abundance. It occurs from very shallow waters to depths of at least 600 fathoms, but for the most part from 30 to 225 fathoms. Spawning takes place from November to January in well defined areas of depths from 150 to 225 fathoms. A large female of 140 pounds may have as many as 2,700,000 eggs. The eggs and larvae drift passively with the currents at depths down to 375 fathoms gradually rising toward the surface as development proceeds and drifting into shallow water with the inshore surface currents. By early spring transformation is complete and the young fish settle to the bottom in the shallow waters of sandy bays and inshore banks. With advancing size and age they appear to move into deeper waters. The females are faster growing than the

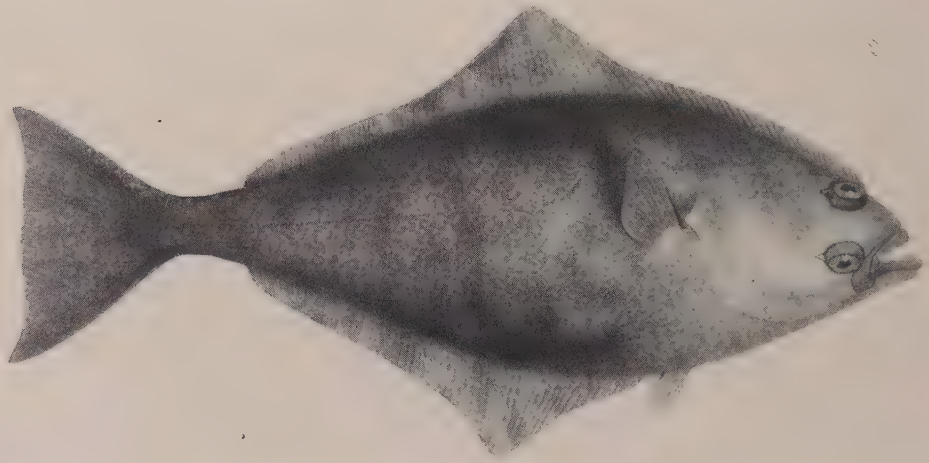

FIGURE 232. Halibut. *Hippoglossus stenolepis* Schmidt 1904

males. The age of maturity of females is 8 to 16 years with an average of 12, while that of the males is considerably earlier. Males may attain a weight of 40 pounds and an age of 25 years; females may attain a weight of 470 pounds and an age of 35 years or more. Tagging operations have shown that the immature halibut move within very restricted areas whereas mature fish migrate extensively to and from the spawning grounds, a few individuals travelling as much as 2,000 miles. The food consists of fishes, crabs, clams, squid, worms, etc. Much of the information concerning the life history of the halibut is the result of the extensive investigations of the International Fisheries Commission.

The halibut is caught on set-lines, the unit of line being the "skate"; these are run out on off-shore relatively shallow areas known as banks, ranging in depth from 10 to 150 fathoms, rarely to 500 fathoms. The bait is usually frozen herring. In the early days of the fishery the gear was set from dories but at the present time the baited lines are payed out directly from the power-boats.

The 1943 catch in Canadian and American Pacific coast waters amounted to 53½ million pounds, of which 13 million pounds were landed by the Canadian fleet. The total value of the above catch to the fishermen was about $8,000,000, of which about $1,250,000 represented the value of livers and viscera used for the production of vitamin "A". Landings at British Columbia ports for transshipment amounted to about 47 per cent of the combined American and Canadian production.

Range northern California to northwestern Alaska.

Sand sole *Psettichthys melanostictus* Girard 1854

Body elongate, moderately deep, much compressed, dextral; caudal peduncle deep. Head deep; mouth terminal, moderate, nearly symmetrical, gape wide; maxillary extending to point below pupil of eye; teeth large, well developed on both sides of jaws; snout rounded; eyes small; interorbital space broad. Fins: dorsal (1), 72 to 88, beginning in front of eye, first 8 or more rays greatly elongate, exserted; anal, 53 to 66; pelvic, 6, thoracic; caudal, rounded. Lateral line: slightly decurved, then straight; accessory dorsal branch short, close to base of dorsal fin, passing backward to point above posterior tip of operculum, ending in small crook. Scales: imbricated; ctenoid on eye side; cycloid on blind side; on lateral line, 98 to 112; on bases of dorsal, anal and caudal fin rays. Spine before anal fin well developed, exposed. Colour: light green on eyed side with tinge of light brown, everywhere finely speckled with black; general colour that of the sandy beach; white on blind side; dull yellow on tips of dorsal and anal fins in large specimens.

Length to 20 inches.

Distinguished by the long free rays in the anterior end of the dorsal fin, the deep caudal peduncle and the accessory dorsal branch of the lateral line.

The sand sole was first recorded from British Columbia waters in 1891 by Ashdown Green. The first definite locality is for the Queen Charlotte islands given in 1901 by W. H. Osgood. The species is common in the strait of Georgia and no doubt occurs along the whole coast since it has been reported from the west coast of Vancouver island. It is taken commonly on sandy bottoms in trawls. Crustaceans, worms and small molluscs probably constitute the chief food, while anchovies have been reported in some specimens from California waters. The sand sole is of delicate flavour.

Range northern California to southeastern Alaska.

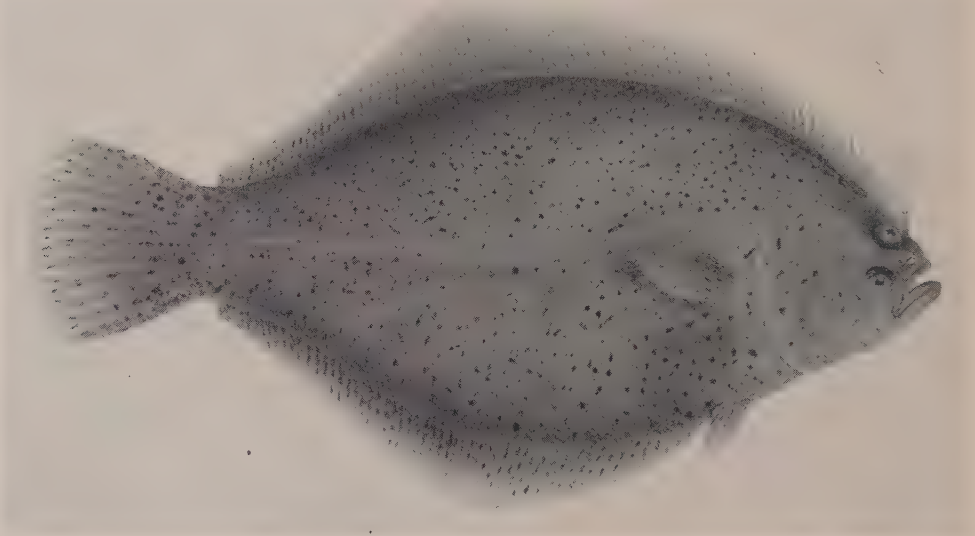

FIGURE 233. Sand sole. *Psettichthys melanostictus* Girard 1854

Slender sole *Lyopsetta exilis* (Jordan and Gilbert) 1880

Body elongate, slender, much compressed, dextral. Head narrow, pointed; mouth terminal, moderate, symmetrical, gape wide; maxillary extending to point below anterior margin of eye; teeth moderate, well developed on both sides of jaws; snout bluntly pointed; eyes large. Fins: dorsal (1), 72 to 88, first rays not elongate; anal, 57 to 65; pelvic, 6, thoracic; caudal, rounded. Lateral line: slightly decurved, then straight; no accessory branch. Scales: imbricated, large, thin, deciduous; ctenoid on both sides of body; in diagonal row between dorsal fin and lateral line at widest part of body, 20 to 24; on lateral line, 65 to 73; on dorsal, anal and caudal fin rays, small. Spine before anal fin well developed, exposed. Colour: pale brown on eyed side, minute dark points outlining margin of each scale; pale orange yellow to white on blind side.

Length to 12 inches.

Distinguished by the slender body, the moderately large mouth, the large rough deciduous scales on both sides of the body and the pale brown coloration.

The slender sole was first taken in British Columbia waters June 19, 1903, in Nanaimo harbour by the *Albatross*, station 4191, lat. 49° 11′ N,. long. 123° 54′ W., depth 54 fathoms and recorded in 1907 by B. W. Evermann and E. L. Goldsborough. The species is common in the strait of Georgia and has been obtained on the west coast of Vancouver island. It frequently occurs in the vicinity of rocky areas. While inhabiting moderate depths it has been reported in California waters from 280 fathoms. The slender sole is captured in trawls but is seldom placed on the market.

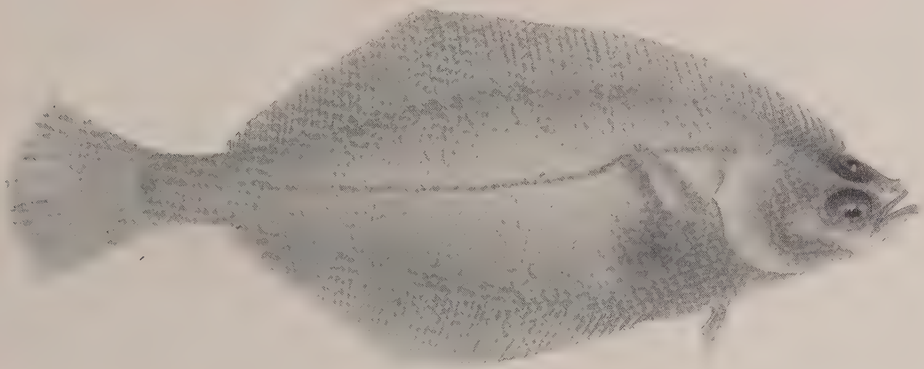

FIGURE 234. Slender sole. *Lyopsetta exilis* (Jordan and Gilbert) 1880

Range southern California to southeastern Alaska.

Flat-head sole *Hippoglossoides elassodon* Jordan and Gilbert 1880

Body elongate, moderately slender, much compressed, dextral. Head moderately deep; mouth terminal, large, symmetrical, gape wide; maxillary reaching to point below pupil of eye; teeth well developed on both sides of jaws, in single row on each jaw; snout pointed. Fins: dorsal (1), 72 to 90, first rays not elongate; anal, 57 to 71; pelvic, 6, thoracic; caudal, double truncate. Lateral line: slightly decurved, then straight; no accessory branch. Scales: imbricated, small, not deciduous; ctenoid on eyed side; cycloid on blind side, except on caudal peduncle and on band on each side of lateral line; in diagonal row between dorsal fin and lateral line at widest part of body, 40 to 50; on lateral line, 87 to 100. Spine before anal fin well developed, exposed. Colour: uniform gray to olive brown on eyed side, sometimes blotched with dusky brown; white on blind side; dusky blotches on dorsal and anal fins.

Length to 18 inches.

Distinguished by the small scales with 40 to 50 in a diagonal row from the dorsal fin to the lateral line at the widest part of the body, the smooth scales on the blind side of the body except on the caudal peduncle and along the lateral line and the teeth in one row on each side of the upper jaw.

The flat-head sole was first taken in British Columbia waters September 2, 1891, west of Jordan river by the *Albatross*, station 3460, lat. 48° 25′ N., long. 124° 10′ W., depth 53 fathoms and recorded in 1895 by C. H. Gilbert. The species is common in the strait of Georgia area in moderately shallow water and occurs northward through Hecate strait. The food consists of annelids, crustaceans and molluscs. This sole is obtained frequently in shrimp and otter trawls and sold in the round or as fillets. Local names include jowl, paper sole and cigarette paper, the latter being applied to immature individuals.

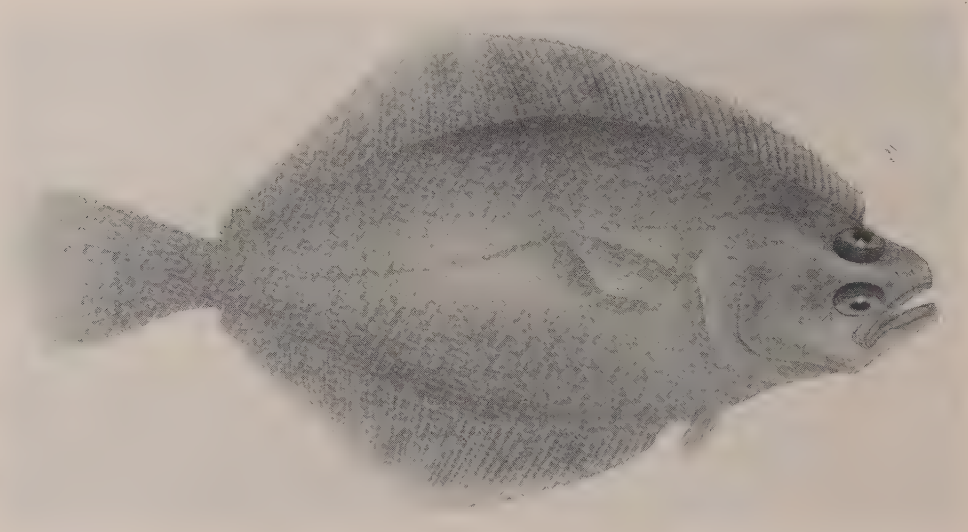

FIGURE 235. Flat-head sole. *Hippoglossoides elassodon* Jordan and Gilbert 1880

Range Puget sound to northwestern Alaska.

Brill *Eopsetta jordani* (Lockington) 1879

Body elongate, moderately slender, much compressed, dextral. Head deep; mouth terminal, large, nearly symmetrical, gape wide; maxillary extending to point slightly behind pupil of eye; teeth well developed on both sides of jaws, on upper jaw in two rows, on lower jaw in single row; snout rounded. Fins: dorsal (1), 87 to 101, first rays not elongate; anal, 67 to 79; pelvic, 6, thoracic; caudal, double truncate. Lateral line: slightly decurved, then straight; no accessory branch. Scales: imbricated, small, not deciduous; ctenoid on eyed side; cycloid on blind side; in diagonal rows between dorsal fin and lateral line at widest part of body, about 30; on lateral line, 88 to 100. Spine before anal fin well developed, exposed. Colour: uniform olive brown on eyed side; white on blind side; dusky blotches on dorsal and anal fins, faint.

Length to 24 inches.

Distinguished by the small scales with about 30 in a diagonal row between the dorsal fin and the lateral line at the widest part of the body, the smooth scales completely covering the blind side of the body and the teeth in 2 rows on each side of the upper jaw.

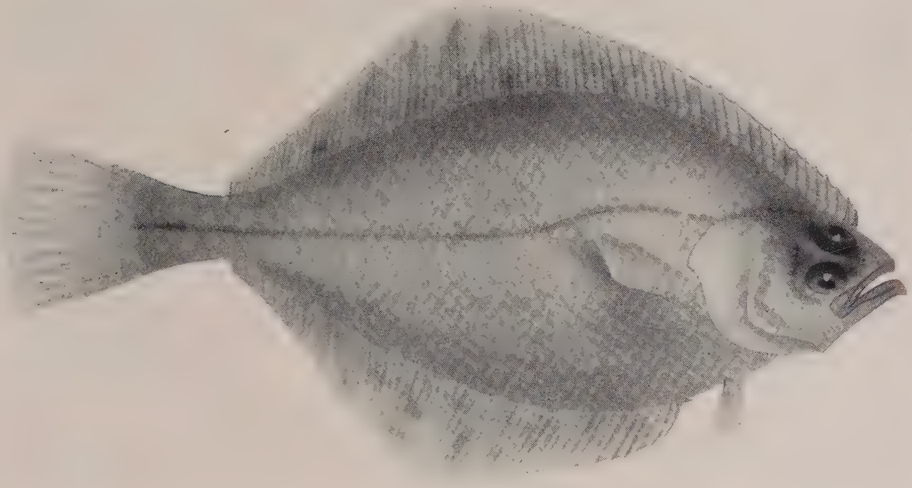

FIGURE 236. Brill. *Eopsetta jordani* (Lockington) 1879

The brill was first taken in British Columbia waters August 4, 1881, at Calvert island in Safety cove by Capt. H. E. Nichols, at a depth of 16 fathoms and recorded in the same year by T. H. Bean as *Hippoglossoides Jordani* Lockington. The species has been secured at Victoria and is abundant on the west coast of Vancouver island and in Hecate strait where it is captured in otter-trawls. The food has been reported to consist of crustaceans and anchovies. The specific name was given in honour of the great ichthyologist, Dr. David Starr Jordan. In American waters this fish is known as the petrale and petrale sole. The word petrale is Mexican and means rocky.

Range southern California to northwestern Alaska.

Rock sole *Lepidopsetta bilineata* (Ayres) 1855

Body elongate, deeply ovate, much compressed, dextral. Head deep; mouth terminal, small, asymmetrical, gape narrow; teeth chiefly on blind sides of jaws; snout bluntly rounded. Fins: dorsal (1), 67 to 82; anal, 51 to 64, very high; pelvic, 6, thoracic; caudal, double truncate. Lateral line: prominently arched over pectoral fin, then straight; accessory dorsal branch short, close to dorsal fin, passing backward to point anterior to posterior tip of operculum. Scales: imbricated; ctenoid on eyed side, some tuberculate; chiefly cycloid on blind side; extending onto dorsal, anal and caudal fin rays; on lateral line, 72 to 85. Spine before anal fin sharp, exposed. Colour: variable; usually deep brown on eyed side, frequently mottled with darker, occasionally with scattered small red spots or pale blotches; reddish yellow to white on blind side; brown to black interrupted streaks on rays of dorsal, anal and caudal fins.

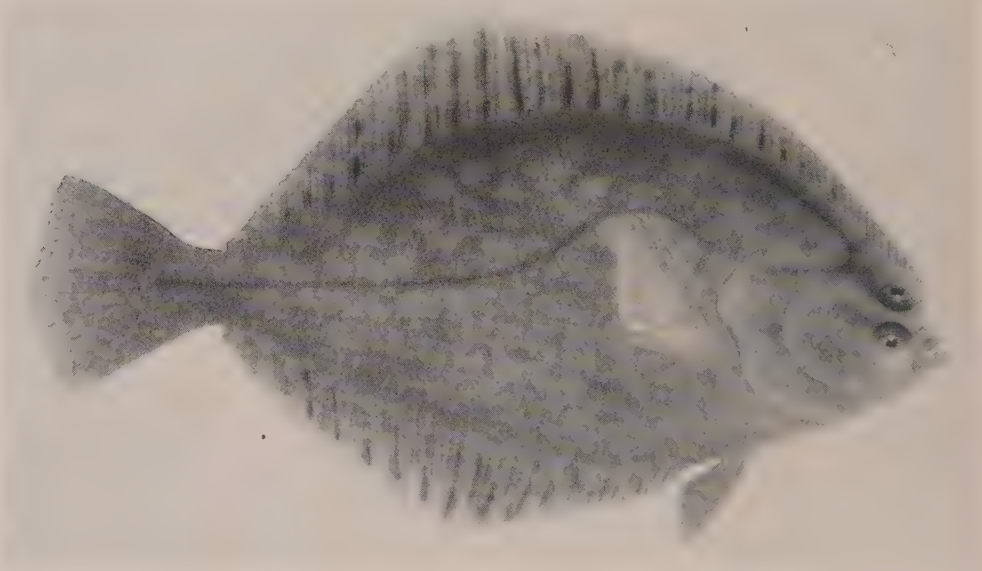

FIGURE 237. Rock sole. *Lepidopsetta bilineata* (Ayres) 1855

Length to 18 inches.

Distinguished by the deeply ovate body, the prominent arch in the lateral line, the short accessory dorsal branch and the rough tuberculated scales on the eyed side of the body.

The rock sole was first recorded from British Columbia waters in 1866 by J. K. Lord as *Pleuronectes bilineates* and *P. umbrosus*, without date or locality of capture. The first specific record was that of a specimen taken in June, 1882, at Broughton island in Carter bay by Capt. H. E. Nichols and recorded in 1883 by T. H. Bean. The species is abundant along the coast and is common in the shallow waters where it is captured frequently with beach-seines in sandy to gravelly areas just offshore from eel-grass beds. In Alaskan waters it has been obtained from a depth of 70 fathoms. While casting with a wet-fly for cut-throat trout in Departure bay, Mr. C. J. Keighley took several of these soles weighing about one-half pound each. Spawning takes place from late winter to early spring. The eggs are bright yellow orange in colour. The food consists of small crabs, shrimps, worms, clam siphons, etc. The flesh is very palatable, although not considered quite as desirable as that of the lemon sole, *Parophrys vetulus*. This fish is also known as the rough-back.

Range southern California to northwestern Alaska.

Curl-fin sole *Pleuronichthys decurrens* Jordan and Gilbert 1880

Body elongate, deeply ovate, much compressed, dextral; caudal peduncle, deep. Head deep; mouth terminal, small, asymmetrical, gape narrow; lips thick; teeth chiefly on blind sides of jaws; snout short, blunt; eyes large, protruding, closely set, obscuring interorbital space; interorbital ridge narrow, prominent tubercle at each end, two or three other tubercles behind upper eye. Fins: dorsal (1), 67 to 79, high, origin on blind side at angle of mouth, first 9 to 12 rays on blind side; anal, 46 to 52, high; pelvic, 6, thoracic; caudal deep, rounded. Lateral line: slightly decurved, then straight; accessory dorsal branch long, close to dorsal fin, passing backward to point about midlength of body. Scales: well separated, deeply embedded in tough skin; cycloid on both sides of body; on lateral line, 80 to 91; present on fins. Spine before anal fin small, exposed, sharp.

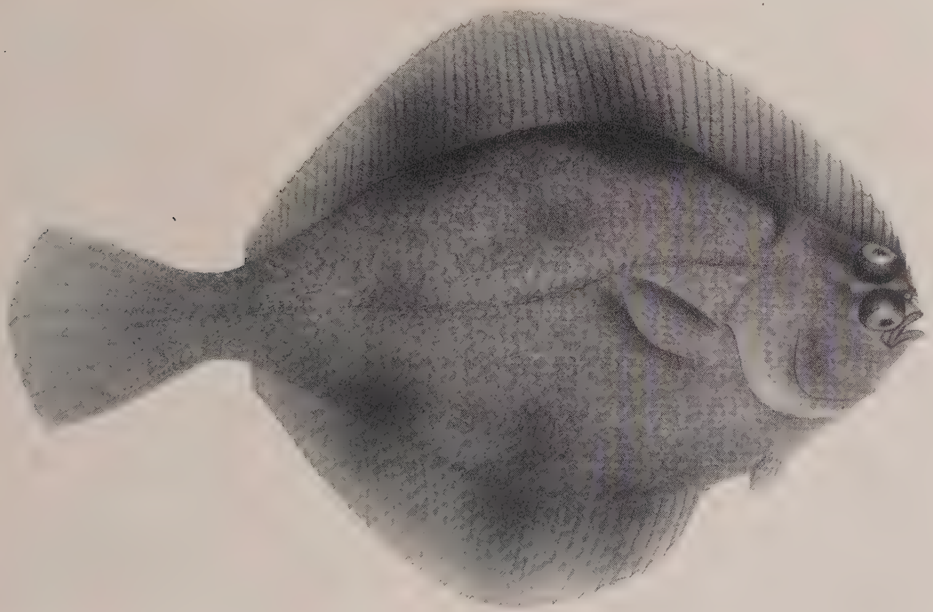

FIGURE 238. Curl-fin sole. *Pleuronichthys decurrens* Jordan and Gilbert 1880

Colour: brown to black on eyed side, mottled, finely spotted, no black spot on middle of body; creamy white on blind side; very dark on all fins.

Length to 12 inches.

Distinguished by the deeply ovate body with the high dorsal and anal fins, the embedded scales and the origin of the dorsal fin on the blind side of the body at the angle of the mouth with the first 9 to 12 rays on the blind side of the body.

The curl-fin sole was first taken in British Columbia waters July 21, 1916, near Rivers inlet and was recorded in 1936 by L. P. Schultz and A. C. DeLacy. The specimen is now in the Royal Ontario Museum of Zoology at Toronto. A second individual has been examined through the kindness of Dr. J. L. Hart. It was obtained October 31, 1944, in Queen Charlotte strait off Hope island in an otter trawl at a depth of 25 fathoms and is now in the collection of the Pacific Biological Station. In California waters this species has been taken at depths ranging from 21 to 291 fathoms. This is not a commercial species in Canada.

Range southern California to northwestern Alaska.

C-O sole *Pleuronichthys coenosus* Girard 1854

Body elongate, deeply ovate, much compressed, dextral; caudal peduncle deep. Head deep; mouth terminal, small, asymmetrical, gape narrow; lips thick;

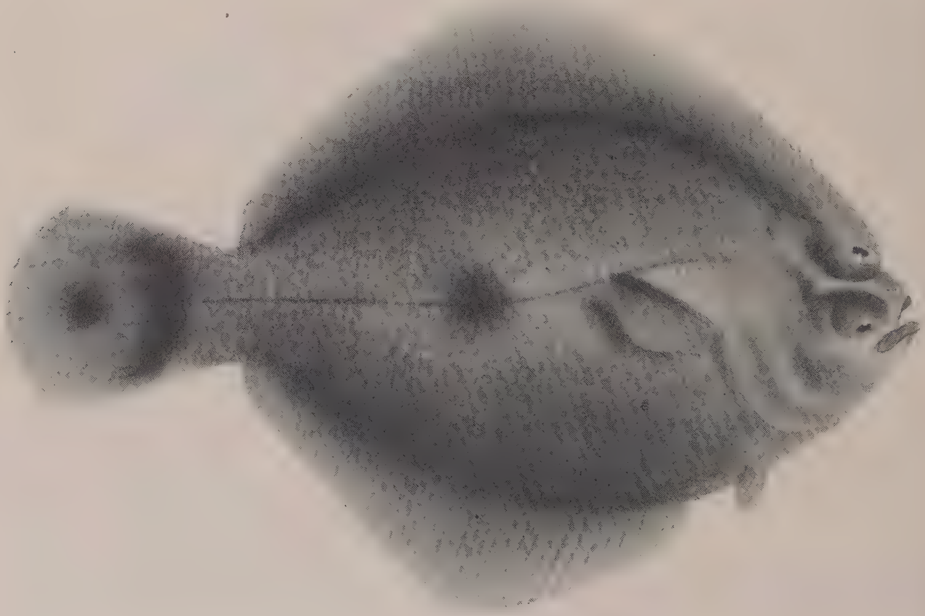

FIGURE 239. C-O sole. *Pleuronichthys coenosus* Girard 1854

teeth chiefly on blind sides of jaws; snout short, blunt; eyes large, protruding, closely set, obscuring interorbital space; interorbital ridge prominent, small downwardly projecting tubercle posteriorly. Fins: dorsal (1), 65 to 78, high, origin on blind side opposite anterior margin of upper eye, first 5 or 6 rays on blind side; anal, 46 to 56, high; pelvic, 6, thoracic; caudal deep, rounded. Lateral line: slightly decurved, then straight; accessory dorsal branch long, close to dorsal fin, passing backward to point about midlength of body. Scales: deeply embedded in tough skin, well separated; cycloid on both sides of body; on lateral line, 61 to 70; present on fins. Spine before anal fin small, exposed, sharp. Colour: dark brown to black on eyed side, conspicuous black spot approximately size of eye on middle of body, sometimes similar spot on middle of caudal fin; dark bar sometimes across base of caudal fin, particularly conspicuous in young fish; creamy white on blind side; very dark on all fins.

Length to 14 inches.

Distinguished by the deeply ovate body with the high dorsal and anal fins, the embedded scales and the origin of the dorsal fin on the blind side of the body opposite the anterior margin of the upper eye with the first 5 or 6 rays on the blind side of the body.

The C-O sole was first recorded from British Columbia waters in 1891 by Ashdown Green. The first definite locality record is that of four specimens taken in 1908 in Departure bay by Messrs. C. H. Young and W. Spreadborough and recorded in 1920 by B. A. Bean and A. C. Weed. The species is abundant in the strait of Georgia and has been taken off the west coast of Vancouver island. The young are common in summer in shallow water but the adults frequently inhabit deep water. The C-O sole is captured in small quantities by trawls in deep water, and small numbers are marketed although the tough skin makes filleting somewhat difficult. Fishermen sometimes call these fish pop-eyes because of the protruding eyes.

Range southern California to southeastern Alaska.

Lemon sole *Parophrys vetulus* Girard 1854

Body elongate, slender, much compressed, dextral. Head slender, pointed; mouth terminal, small, asymmetrical, gape narrow; teeth chiefly on blind sides of jaws; snout bluntly pointed; eyes large, upper somewhat posterior to lower, entering profile; interorbital space narrow, ridge high. Fins: dorsal (1), 72 to 92; anal, 54 to 70; pelvic, 6, thoracic; caudal, truncate. Lateral line: slightly decurved, then straight; accessory dorsal branch long, close to dorsal fin, passing backward to point above pectoral fin, varying from midpoint to tip. Scales: imbricated; cycloid on both sides of body anteriorly; ctenoid posteriorly; on lateral line, 89 to 105; ctenoid on cheek; absent from fins. Colour: uniform yellowish brown on eyed side; light yellow to white, tinged with reddish brown on blind side; young variously coloured from gray to brown, minutely spotted, often of sandy appearance on dorsal surface; in young less than 2 inches in length often bright yellow line on ventral surface below base of dorsal fin and of anal fin.

Length to 21 inches.

Distinguished by the pointed head, the accessory dorsal branch of the lateral line and the scales on the body smooth anteriorly, rough posteriorly.

The lemon sole was first recorded from British Columbia waters in 1862 from Victoria by A. Günther as a new species, *Pleuronectes digrammus*, on the basis of two specimens, each about 8 inches in length, obtained by H.M.S. *Plumper* and presented to the British Museum by Earl Russell. The species is common along the whole coast and is taken frequently in trawls at depths between 20 and 50 fathoms on sandy to muddy bottoms. Spawning occurs from February to April. The eggs are pelagic and transparent white to pale bluish purple in colour. The food consists of small crabs, shrimps, worms, clam siphons and small molluscs. This is the choicest of the smaller flat-fishes, having a very delicate flavour, and fillet of sole in the local markets is usually this species. It has been given the name lemon sole because of its resemblance in shape and colour to the lemon sole of European waters. There is a faint lemon odour to the freshly-caught fish. In American waters the name of English sole is applied.

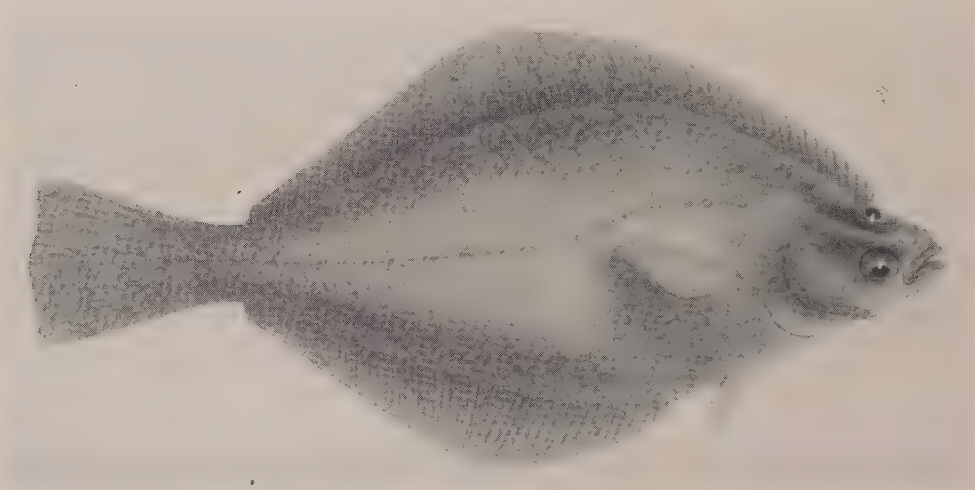

FIGURE 240. Lemon sole. *Parophrys vetulus* Girard 1854

Range southern California to northwestern Alaska.

Butter sole *Isopsetta isolepis* (Lockington) 1880

Body elongate, slender, much compressed, dextral. Head slender; mouth terminal small, asymmetrical, gape narrow; teeth chiefly on blind sides of jaws; snout bluntly rounded; eyes small; interorbital space narrow, flat. Fins: dorsal (1), 78 to 92; anal, 58 to 69; pelvic, 6, thoracic; caudal, rounded. Lateral line: slightly decurved, then straight; accessory dorsal branch close to dorsal fin, passing backward to point above pectoral fin, varying from midpoint to tip. Scales: imbricated, rather large, strongly ctenoid on eyed side; chiefly cycloid on blind side; on lateral line, 78 to 84; ctenoid on head and fin rays. Colour: gray, irregularly blotched and spotted with yellow or green on eyed side; white on blind side; bright lemon yellow on tips of dorsal and anal fin rays.

Length to 18 inches.

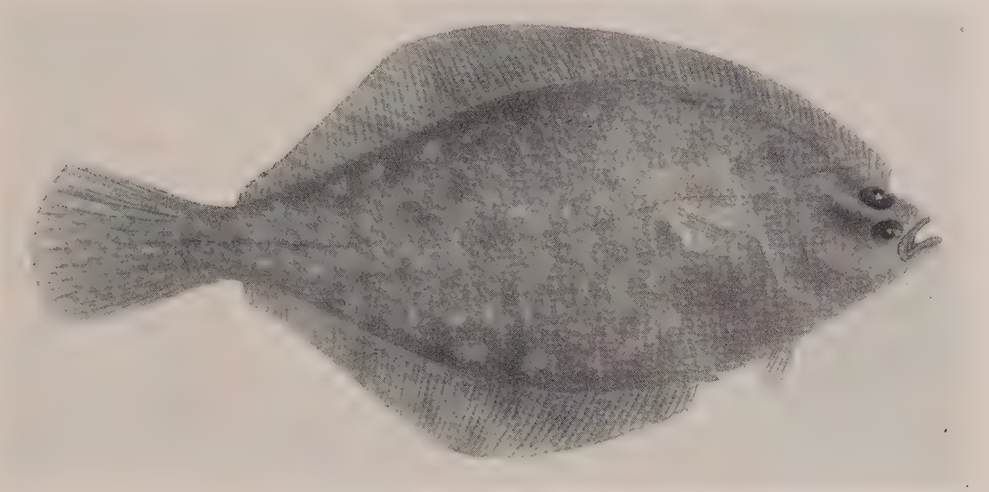

FIGURE 241. Butter sole. *Isopsetta isolepis* (Lockington) 1880

Distinguished by the rough scales on the eyed side of the body including the head and the fins and the bright lemon yellow coloration on the tips of the dorsal and anal fins.

The butter sole was first taken in British Columbia waters in the summer of 1928, off San Juan harbour and the specimen is now in the Royal Ontario Museum of Zoology at Toronto. An individual was secured May 16, 1934, in Clayoquot sound west of Flores island at a depth of 27 fathoms by the *Wm. J. Stewart* expedition. Occasionally specimens are obtained in the strait of Georgia and large numbers are taken in Hecate strait in otter trawls. Usually this species is found on a soft silty bottom. Spawning occurs from March to late April. The eggs are white in colour. Considerable quantities are marketed as fillets.

Range southern California to northwestern Alaska.

Yellow-fin sole *Limanda aspera* (Pallas) 1811

Body elongate, deeply ovate, compressed, dextral. Head moderately deep; mouth terminal, small, asymmetrical, gape narrow; teeth chiefly on blind sides of jaws; snout bluntly rounded, shorter than diameter of eye; eyes moderately large; interorbital space narrow. Fins: dorsal (1), 61 to 67; anal, 49 to 58;

pelvic, 6, thoracic; caudal, truncate. Lateral line: prominently arched over pectoral fin; no accessory branch. Scales: slightly imbricated; ctenoid on both sides of body; on lateral line, 49 to 58; extending onto anterior rays of dorsal and anal fins. Colour: light brown on eyed side; narrow black line following contour of body at bases of dorsal and anal fins; white on blind side, sometimes faintly tinged with yellow; orange yellow on fins.

Length to 15 inches.

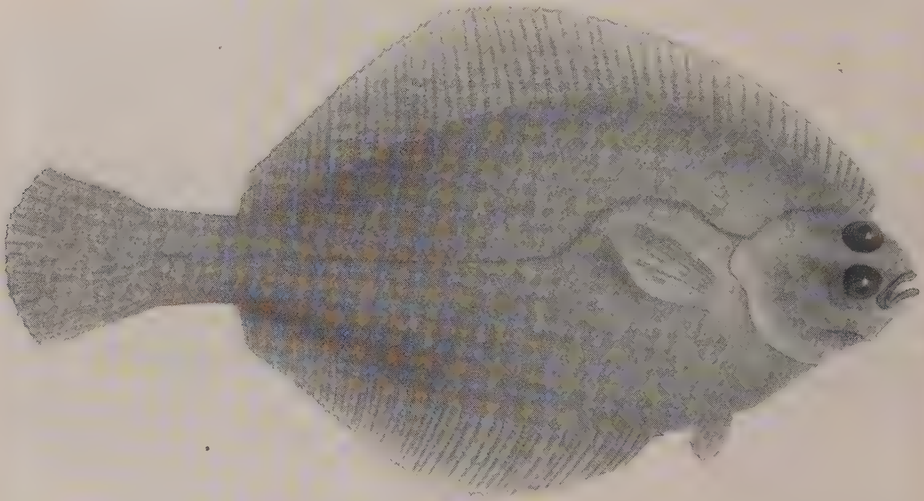

Figure 242. Yellow-fin sole. *Limanda aspera* (Pallas) 1811

Distinguished by the prominent arch in the lateral line over the pectoral fin, the absence of an accessory branch, the orange yellow coloration of the fins and the distinct black line on the eyed side of the body at the bases of the dorsal and anal fins.

The yellow-fin sole was first taken in British Columbia waters in June, 1882, at Port Simpson and in Cardenas bay by Capt. H. E. Nichols and recorded in 1883 by T. H. Bean. The species has been recorded from the Queen Charlotte islands and is commonly taken in Hecate strait by otter trawls. The food consists in part of hydroids, worms, molluscs and brittle-stars. With the increase in trawling in northern waters this fish has come into the markets and is sold chiefly as fillets. It is also known as the northern sole.

Range northern British Columbia to northwestern Alaska.

Starry flounder *Platichthys stellatus* (Pallas) 1811

Body elongate, deep, much compressed, dextral or sinistral. Head deep; mouth terminal, small, asymmetrical, gape narrow; lower jaw projecting; teeth chiefly on blind sides of jaws; snout bluntly rounded; eyes small. Fins: dorsal (1), 52 to 66; anal, 38 to 47; pelvic, 6, thoracic; caudal, truncate. Lateral line: slightly decurved, then straight; no accessory branch. Scales: well separated, small, cycloid, chiefly on posterior portion of body; in form of spinous stellate plates, well separated, numerous, on eyed side, more or less in bands on blind side; absent from lateral line. Pores: on lateral line, 38 to 47. Colour: dark brown to nearly black, on eyed side; white to creamy white, on blind side; black bands on dorsal and anal fins, 4 to 7, vertical; black stripes on caudal fin, 4 to 6, longitudinal; white, orange yellow or reddish orange areas between bands and stripes, occasionally bands and stripes tinged with orange, more pronounced on large individuals taken in shallow water.

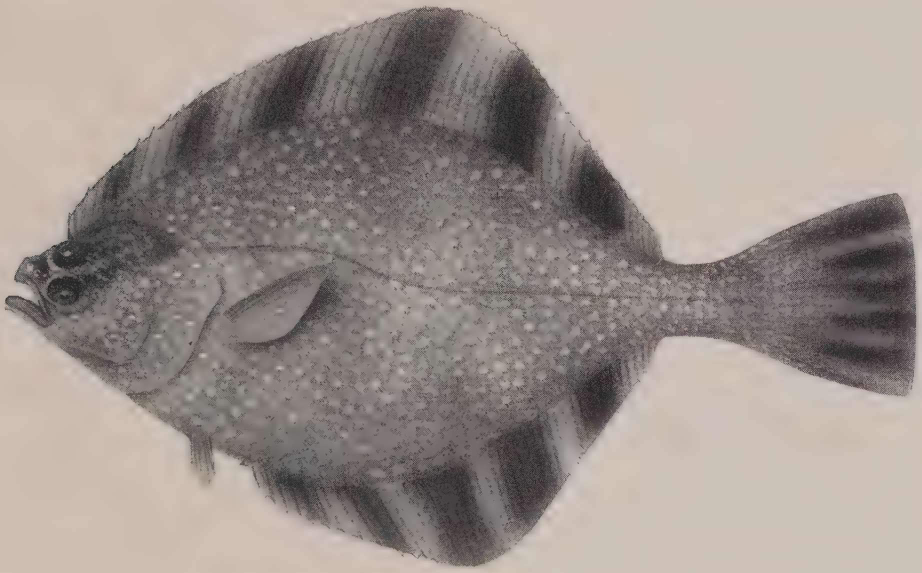

FIGURE 243. Starry flounder. *Platichthys stellatus* (Pallas) 1811

Length to 3 feet.

Distinguished by the black bands on the dorsal and anal fins, the black stripes on the caudal fin and the spinous stellate plates.

The starry flounder was first recorded from British Columbia waters in 1862 by A. Günther as *Pleuronectes stellatus* Pallas, on the basis of a skin from Esquimalt harbour, collected by H.M.S. *Plumper* and presented to the British Museum by Earl Russell. In 1866, J. K. Lord recorded the species from British Columbia waters under the names of *Platichthys rugosus* and *Pleuronectes stellatus*. This fish is very abundant along the whole coast, living in shallow water on sandy bottoms for the most part, but occasionally occurring in deeper water where it is taken on halibut gear. Spawning occurs in late winter and early spring. The eggs are pale orange yellow in colour. The young frequently move into streams for some distances. The food consists of crabs, shrimps, worms, clams and clam siphons, small molluscs and small fishes, including *Lycodopsis pacificus.* This is the flounder which is most commonly "left-handed" or sinistral, some collections containing as high as 60% of such individuals. Rarely the halibut and the flathead sole may be sinistral, while the sand dabs are normally so. Weights up to 20 pounds have been recorded. This fish is also known as the grindstone or emery wheel because of its extreme roughness.

Range southern California to northwestern Alaska.

Rex sole *Glyptocephalus zachirus* Lockington 1879

Body elongate, slender, much compressed, dextral; caudal peduncle very short. Head slender, short; mouth terminal, small, asymmetrical, gape narrow, smaller on eyed side than on blind side; teeth chiefly on blind sides of jaws; snout bluntly rounded; eyes large, lower slightly in advance of upper; gill opening extending above base of uppermost pectoral fin ray. Fins: dorsal (1), 87 to 110; anal, 78 to 93; pelvic, 6, thoracic; pectoral (2), that on eyed side greatly elongate, pointed, much longer than that on blind side, shorter in young but always longer than that on blind side; caudal, rounded. Lateral line: nearly straight; no accessory branch. Scales: imbricated, small, cycloid, uniform over body; on lateral line, 132 to 138. Colour: uniform light brown on eyed side; white to faintly dusky on blind side; dusky on fins.

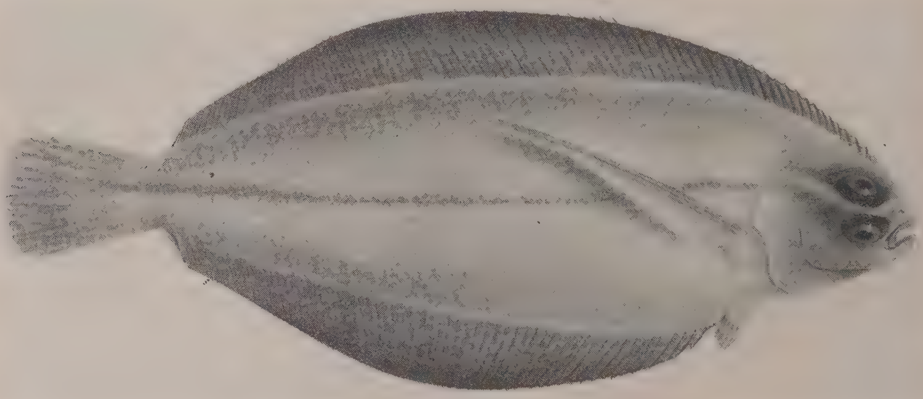

FIGURE 244. Rex sole. *Glyptocephalus zachirus* Lockington 1879

Length to 18 inches.

Distinguished by the long pectoral fin on the eyed side of the body, the nearly straight lateral line without an accessory branch and the gill openings extending above the bases of the pectoral fins.

The rex sole was first taken in British Columbia waters August 28, 1891, west of Port San Juan, by the *Albatross*, station 3447, lat. 48° 30′ N., long. 124° 36′ W., depth 116 fathoms, and recorded in 1895 by C. H. Gilbert. The species is fairly common in the strait of Georgia and specimens have been obtained from the west coast of Vancouver island, from the north end of Vancouver island near Fort Rupert, from Hecate strait and from the Queen Charlotte islands at Rose spit. The rex sole is captured in trawls operating at depths from 10 to 136 fathoms, but off the Alaskan coast it has been secured at depths down to 350 fathoms. While it usually is considered as very palatable only small numbers appear on the market. The name *Errex zachirus* has been applied to this species in some publications. The terms witch and long-fin sole frequently are applied to this fish.

Range southern California to northwestern Alaska.

Dover sole *Microstomus pacificus* (Lockington) 1879

Body elongate, slender, compressed, dextral; caudal peduncle very short. Head slender, short; mouth terminal, small, asymmetrical, gape narrow, nearly equal on each side; teeth chiefly on blind sides of jaws; snout bluntly rounded; eyes small, lower in advance of upper; gill opening not extending above base of uppermost pectoral fin ray. Fins: dorsal (1), 90 to 116; anal, 80 to 96; pelvic, 6, thoracic; pectoral, small, that on eyed side not elongate, length much less than that of head; caudal, rounded. Lateral line: nearly straight, rather indistinct; no accessory branch. Scales: imbricated, very small, cycloid, deciduous, uniform over body; on lateral line, 137 to 146. Mucous secretion in form of profuse slime. Colour: uniform light to dark brown on eyed side; somewhat lighter on blind side; dusky on fins, more intense towards tips of rays.

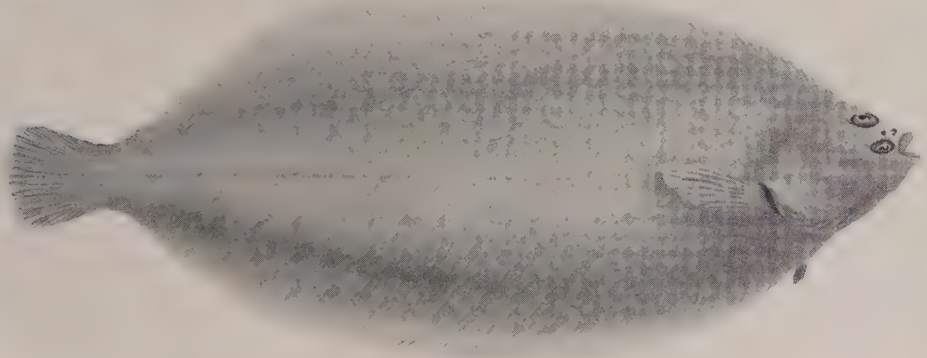

FIGURE 245. Dover sole. *Microstomus pacificus* (Lockington) 1879

Length to 2 feet.

Distinguished by the abundance of slime, the nearly straight and indistinct lateral line without an accessory branch and the gill openings not extending above the bases of the uppermost pectoral fin rays.

The Dover sole was first taken in British Columbia waters August 28, 1891, west of Port San Juan by the *Albatross*, station 3447, lat. 48° 30′ N., long. 124° 36′ W., depth 116 fathoms and recorded in 1895 by C. H. Gilbert. The species is distributed generally along the coast from Juan de Fuca strait to the Queen Charlotte islands, occurring on muddy bottoms usually at depths below 30 fathoms. In western American waters it has been found at depths from 33 to 516 fathoms. The Dover sole is fairly abundant in the strait of Georgia off the mouth of the Fraser river where it is secured in trawls along with the lemon sole, *Parophrys vetulus*. A large amount of slime is produced which is particularly undesirable in the trawl as it covers other fishes giving the catch a whitish mucilaginous coating. Because of this characteristic the Dover sole is frequently discarded by the fishermen although the flesh is very palatable. This fish is also known as the slime or slippery sole.

Range southern California to northwestern Alaska.

Order DISCOCEPHALI

In this order there is a large dorsal adhesive disk extending forward on the head to the tip of the snout. This disk is developed by a flattening of the spinous dorsal fin together with a division of each spine to form a paired series of flattened laminae. The resulting structure is a flat, oval, transversely laminated disk with the laminae denticulated along their free posterior margins. As the disk is applied to the object of attachment, such as fishes, sea-turtles, whales or ships, the laminae are raised, creating a series of suction chambers. Backward pressure tends to engage and hold the disk, while a forward movement on the part of the fish releases the suction. Fossil species show a small narrow disk entirely behind the head and having a form more like a normal dorsal fin.

The order is closely related to the Percomorphi and comprises one family with four genera and about ten species, mostly of tropical waters.

Family ECHENEIDAE — Remoras

The remoras are mostly small fishes but the largest attains a length of over 3 feet. They are predaceous, feeding upon a variety of small fishes, particularly those that school.

Ordinarily these fishes attach themselves to external surfaces but some individuals have been found adhering within the mouths and gill chambers of such fishes as mantas, tunas, sword-fishes, ocean sun-fishes, etc. This attachment is usually stated to be for protection but is more likely to be a means of increasing the opportunity of gaining food and reducing the labour of getting it.

Remoras have been used to catch fishes, turtles, etc. A ring to which a cord is attached is fastened around the tail. When the remora is liberated it promptly attaches itself to the moving objects which may then be pulled slowly ashore.

Whale-sucker *Remilegia australis* (Bennett) 1840

Body elongate, depressed anteriorly, compressed posteriorly. Head elongate, much depressed, broad; mouth terminal, small, gape wide; maxillary reaching to point below vertical from nostril; upper jaw broad, slightly notched; lower jaw projecting, narrower than upper; teeth in bands, small, villiform, outer row slightly enlarged; snout truncate; gill membranes separate, free from isthmus. Fins: dorsal (2), XXV to XXVII—20 to 23, spinous fin forming large adhesive disk on upper surface of head and anterior of body, extending to vertical well behind tips of pelvic fins, length about 2 1/3 in total length, disk broader than head and body, subelliptical, obtusely rounded anteriorly and posteriorly, laminae minutely denticulate, large smooth area on posterior portion roughly triangular, rayed fin low; anal, 20 to 24, low, opposite rayed dorsal; pelvic, I, 5, thoracic, depressible into groove on abdomen, membrane of fifth ray partially adnate to groove; pectoral, rounded, high on body; caudal, slightly concave. Lateral line: high, decurved anteriorly, straight posteriorly. Scales: embedded, cycloid, minute. Colour: dark gray to brown on dorsal surface; darker on ventral surface.

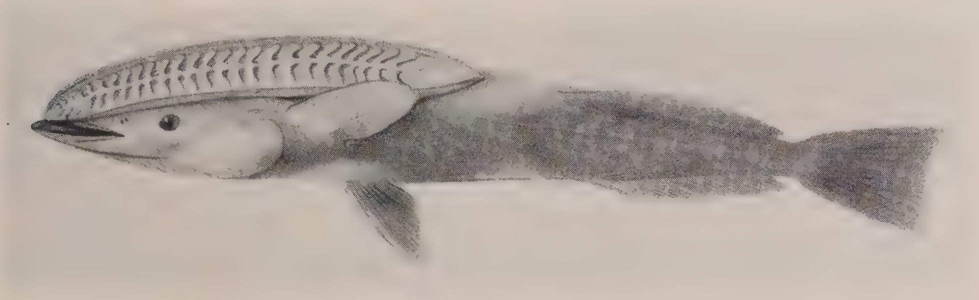

FIGURE 246. Whale-sucker. *Remilegia australis* (Bennett) 1840

Length to 20 inches.

Distinguished by the very large adhesive disk on the top of the head and anterior portion of the body with the 25 to 27 laminae.

The whale-sucker was first taken in British Columbia waters in June, 1907, at Sechart by Mr. T. Kermode and recorded in 1936 by L. P. Schultz and A. C. DeLacy as *Remora remora* (Linnaeus). Three specimens, all about 8 inches in length, were obtained from a sulphur-bottom whale and are now in the Provincial Museum at Victoria. This is a fish of the tropical seas and is rarely obtained, having been reported from the Indian ocean, from the Atlantic ocean southwest of the Cape Verde islands attached to a dolphin and from the coast of Texas in the vicinity of Corpus Christi.

Range Vancouver island.

Order PLECTOGNATHI

In this order the mouth is small with short powerful jaws; the premaxillaries and maxillaries are more or less fused. The gill openings are restricted in size and do not extend below the bases of the pectoral fins. The body is covered with scales, rough shields or bony plates, or is naked. The spinous dorsal fin, when present, consists of a small number of spines; the rayed dorsal and anal fins are opposite and far back on the body; the pelvic fins are absent.

The order includes a varied group of fishes such as the trigger-fish, parrot-fish, file-fish, trunk-fish, porcupine-fish, burr-fish and ocean sun-fish. These are chiefly tropical in distribution and the flesh of many of them is poisonous.

Family MOLIDAE Ocean sun-fishes

In the ocean sun-fishes the body is deep, compressed, truncate posteriorly and covered with a thick, rough, scaleless skin. The teeth are fused forming a single bony sharp-edged plate, or "beak", in each jaw.

These are fishes of the open sea and are often observed at the surface in calm weather. They are reported to swim by moving the dorsal and anal fins sidewise with a twisting motion which results in a propellor effect. The pectoral fins move continuously and act as stabilizers while the caudal fin serves as a rudder. The adults become large and grotesque often drifting passively in the current although at times they dive to considerable depths. Specimens have been known to attain a length of 9 feet and a weight estimated at about a ton.

Ocean sun-fish *Mola mola* (Linnaeus) 1758

Body short, deep, ovate, greatly compressed. Head deep, compressed; mouth terminal, small; teeth beak-like; eye small; gill opening in front of pectoral fin, smaller than diameter of eye. Skin: thick, rough, leathery. Fins: dorsal (1), 17 or 18; anal, 16 to 18; both fins short, very high, far back on body; pelvic, absent; pectoral, small; caudal short, very broad, outline wavy. Lateral line: absent. Scales: absent. Colour: dark gray on dorsal surface; grayish brown on sides with silvery reflections; light gray band at bases of dorsal, anal and caudal fins.

Length to 9 feet.

Distinguished by the short deep greatly compressed body, the high dorsal and anal fins placed far back on the body and the absence of pelvic fins.

The ocean sun-fish was first taken in British Columbia waters July 14, 1915, off Ucluelet by Indians, presented to the Provincial Museum by Mr. A. Jansen, and now represented by a model. It was recorded in 1916 by F. Kermode. Individuals appear occasionally off the west coasts of Vancouver and the Queen Charlotte islands and one has been reported from inside waters near Butedale. This is a southern or tropical form and small to medium-sized specimens up to 3 feet in length arrive in British Columbia waters in certain years. The fish frequently swim slowly or drift at or near the surface but smaller individuals are capable of more active movements, even to leaping clear of the water. The ocean sun-fish reaches a weight of about a ton. In spite of its size it has a relatively small brain and a very short spinal cord. The eggs are produced in enormous quantities, estimated as high as 300,000,000 in a pair of ovaries. These are set free in the open ocean, and when hatched, each produces an elongate larva about 1/10 of an inch in length with a well developed caudal fin. The caudal fin soon disappears and at the same time the body becomes covered with numerous spines, five of which grow very large. The body then changes in shape, becoming deeper than long and truncate posteriorly; the spines get smaller and finally disappear while a new short broad tail develops. The approximate length at this stage is about ½ inch. From this point the fish gradually gets larger, assuming the adult shape. The food consists of jelly-fishes, crustaceans and molluscs, brittle-

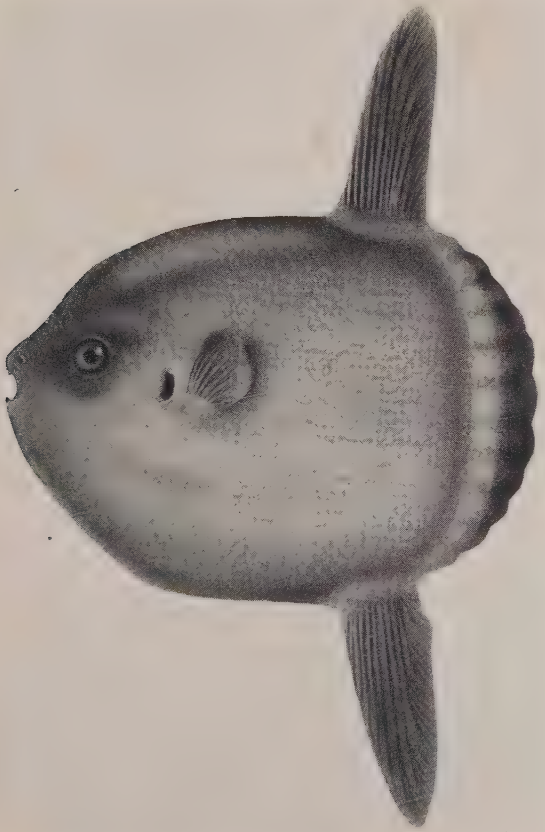

FIGURE 247. Ocean sun-fish. *Mola mola* (Linnaeus) 1758

stars and small fishes. The word *Mola* means millstone which perhaps would be a more appropriate common name than head-fish used by some authors.

Range southern California to southeastern Alaska.

Order MALACICHTHYES

In this order the body is moderately deep and compressed. Scales are absent or reduced to a few spiny tubercles or spinules. The skeleton is weakly ossified so that the body is limp. All fins are supported by rays only; the pelvic fins, when present, are thoracic.

One family is represented in the order, the Icosteidae.

Family ICOSTEIDAE Rag-fishes

While the rag-fishes probably inhabit the deeper parts of the north Pacific ocean, the majority of the specimens taken in British Columbia have been from moderately shallow waters.

Fan-tailed rag-fish *Icosteus aenigmaticus* Lockington 1880

Body elongate, oblong, moderately deep, much compressed, flexible, entirely limp; regions along bases of dorsal and anal fins strongly compressed; caudal peduncle, slender. Head short; mouth terminal, small; jaws about equal; teeth minute; snout, blunt. Skin: smooth, encroaching upon all fins except caudal. Fins: dorsal (1), 52 to 55, low anteriorly, higher posteriorly, maximum height near posterior end; anal, 37 to 40, similar to dorsal; pelvic, 5, thoracic, small, narrow; pectoral and caudal, fan-shaped, symmetrically rounded, bases swollen. Lateral line: flatly arched, then straight. Scales: on lateral line, reduced to groups of small spines, sometimes referred to as spiny tubercles; on fins, numerous, very

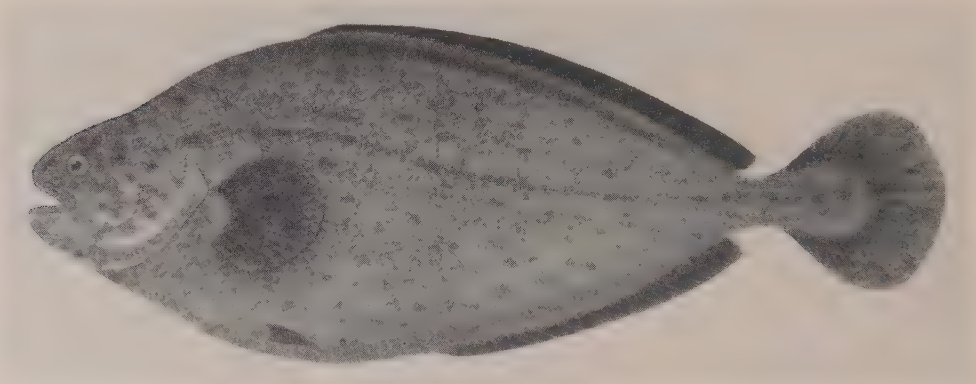

FIGURE 248. Fan-tailed rag-fish. *Icosteus aenigmaticus* Lockington 1880

small, reduced to spinules; otherwise absent from body. Colour: pellucid yellow and brown, irregularly spotted and blotched with faint purple; dusky on fins.

Length to 16½ inches.

Distinguished by the limp compressed oblong body with the smooth skin, the groups of spines on each lateral line, the pelvic fins each with 5 rays and the rounded pectoral and caudal fins with the swollen bases.

The fan-tailed rag-fish was first taken in British Columbia waters September 25, 1928, in the Queen Charlotte islands area at Werner bay by Messrs. G. J. Alexander and J. R. Townsend in a purse-seine. This individual was recorded in 1929 by A. L. Pritchard and deposited in the fish collection of the Pacific Biological Station. A second specimen was obtained July 22, 1941, in Barkley sound by Mr. F. H. Carroll and is now in the Provincial Museum at Victoria. The species occurs at rare intervals along the coast. Apparently it is an inhabitant of deep water for its body is exceedingly soft and flexible and "can be doubled up as readily as a piece of soft thick rag".

Range southern California to Queen Charlotte islands.

Brown rag-fish *Acrotus willoughbyi* Bean 1887

Body elongate, moderately deep, elliptical, greatly compressed, limp; caudal peduncle very slender. Head very short; mouth terminal, small; jaws approximately equal; snout blunt; eye very small. Skin: thick, rough. Fins: dorsal (1), 38 to 42, very low anteriorly, higher posteriorly, maximum height near posterior end; anal, 34 to 38, similar to dorsal; pelvic, absent; pectoral, small, pointed; caudal, broad, emarginate. Lateral line: slightly arched, then straight. Scales: absent. Colour: chocolate brown; rich dark brown on inside of mouth and gill openings.

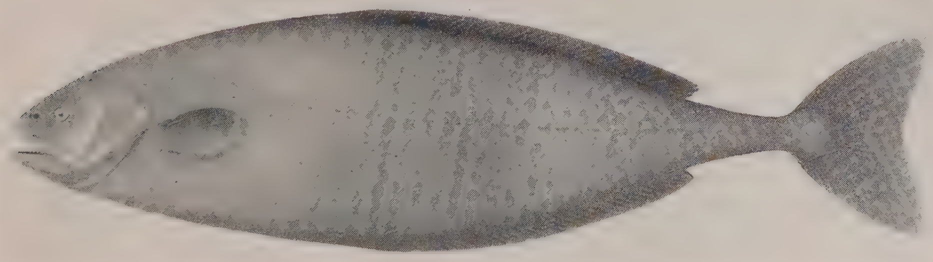

FIGURE 249. Brown rag-fish. *Acrotus willoughbyi* Bean 1887

Length to 7 feet.

Distinguished by the elongate, elliptical, greatly compressed limp body without scales, the very slender caudal peduncle, the absence of pelvic fins, the broad emarginate caudal fin, the small eyes and the plain brown coloration.

The brown rag-fish was first taken in British Columbia waters July 19, 1912, near Victoria, by Mr. J. Dixon and recorded in 1913 by F. Kermode. During the summers of 1936 and 1937 individuals were found commonly in stomachs of sperm whales taken 30 miles off Rose harbour in the Queen Charlotte islands. The species has been reported from time to time along the Pacific coast.

Range southern California to southeastern Alaska.

Order XENOPTERYGII

In this order the head is depressed. Scales are absent. The dorsal and anal fins are supported by rays only; the pelvic fins are thoracic and united anteriorly, forming with a fold of skin a large cleft adhesive disk.

The order includes a single family, the Gobiesocidae.

Family GOBIESOCIDAE Cling-fishes

The cling-fishes are chiefly found in tropical waters although some extend into temperate seas. They inhabit the littoral zone, adhering to rocks and shells. The food consists largely of small invertebrates. Their body colours vary from pale brown to cherry red which blend with their immediate surroundings.

Common cling-fish *Sicyogaster maeandricus* (Girard) 1858

Body elongate, stout, depressed anteriorly, compressed posteriorly. Head very large, depressed, broad; mouth terminal, large; lower jaw included; snout bluntly rounded; gill membranes united, free from isthmus. Anus about midpoint between posterior margin of adhesive disk and origin of anal fin. Anal papilla short, conical. Fins: dorsal (1), 13 to 16, far back on body; anal, 12 to 14, origin slightly posterior to that of dorsal; pelvic, thoracic, large, united anteriorly by membrane to form anterior portion of large adhesive disk whose posterior portion formed by broad fold of skin from ventral surface of body, anterior and posterior portions separated by lateral clefts; pectoral short, broad; caudal, rounded. Lateral line: absent. Scales: absent. Colour: light olive

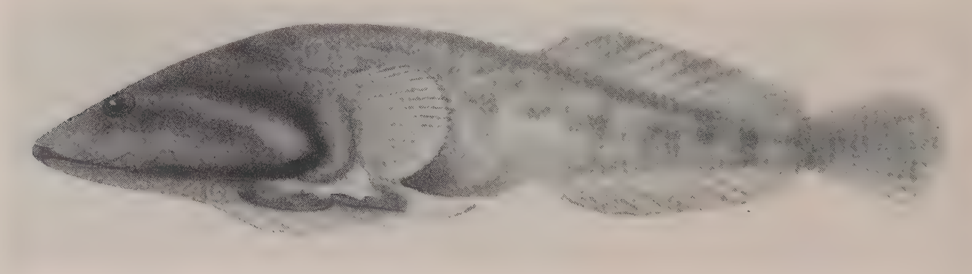

FIGURE 250. Common cling-fish. *Sicyogaster maeandricus* (Girard) 1858

brown to cherry red; everywhere reticulated with brownish orange; sometimes streaked or speckled with black; pale brown bar between eyes, another across cheek.

Length to 6 inches.

Distinguished by the broad flat head, the single rayed dorsal fin set far back on the body and the large cleft adhesive disk.

The common cling-fish was first taken in British Columbia waters in June, 1893, at Comox, when fourteen specimens under 3½ inches in length were secured by Mr. J. Macoun. This collection was recorded in 1920 by B. A. Bean and A. C. Weed as *Caularchus maeandricus* (Girard), although the first published record was that of W. H. Osgood in 1901 for the Queen Charlotte islands, also listed as *Caularchus maeandricus*. The common cling-fish occurs along the whole coast as far north as the Queen Charlotte islands and is particularly abundant in the strait of Georgia. It clings to the rocks in the intertidal zone and feeds upon small crustaceans and molluscs.

Range southern California to southeastern Alaska.

Slender cling-fish *Rimicola eigenmanni* (Gilbert) 1890

Body elongate, slender. Head small, much depressed, narrow; mouth terminal, small; lower jaw included; snout bluntly rounded; gill membranes united, free from isthmus. Anus much nearer anal fin than adhesive disk. Anal papilla long, slender, conical. Fins: dorsal (1), 6 to 8, far back on body, first one or two rays embedded; anal, 6 to 8, origin slightly anterior to that of dorsal, first one or two rays embedded; pelvic, thoracic, united anteriorly by membrane to form anterior portion of small adhesive disk whose posterior formed by broad fold of skin from ventral surface of body, anterior and posterior portions separated by lateral clefts; pectoral, short, broad; caudal, rounded. Lateral line: absent. Scales: absent. Colour: light olive green to brown; in female, sometimes sparsely covered with distinct brownish red spots as large as pupil of eye.

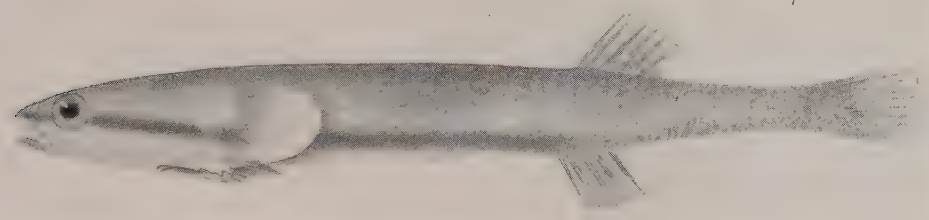

FIGURE 251. Slender cling-fish. *Rimicola eigenmanni* (Gilbert) 1890

Length to 1½ inches.

Distinguished by the slender body, the single small rayed dorsal fin set far back on the body and the small cleft adhesive disk.

The slender cling-fish has been taken once only in British Columbia waters. Four individuals, all males, were secured May 3, 1935, during an extremely low tide on the west coast of Vancouver island in Clayoquot sound on Round island flats by Dr. J. L. Hart and are now in the collection of the Pacific Biological Station at Nanaimo. These specimens were recorded in 1936 by G. V. Wilby. This is the first record of the species north of Monterey, California.

Range southern California to west coast of Vancouver island.

Order HAPLODOCI

In this order the body is stout anteriorly. Scales, if present, are ctenoid. The gill openings are somewhat restricted. The spinous dorsal fin is small, supported by 2 to 4 spines; the rayed dorsal and anal fins are long; the pelvic fins are thoracic, with 1 spine and 2 or 3 rays.

The order comprises a single family, the Batrachoididae.

Family BATRACHOIDIDAE Toad-fishes

The toad-fishes are chiefly tropical in distribution, living on the bottom in shallow to moderately deep water. In some species the spines of the head and dorsal fin are hollow and each is connected with a poison gland. A poisonous secretion is discharged through the hollow spine in a similar manner to the ejection of the venom from the fang of a snake.

Midshipman *Porichthys notatus* Girard 1854

Body elongate, stout anteriorly. Head large, much depressed, broad; mouth terminal, large; lower jaw projecting; maxillary reaching to point below posterior margin of eye; teeth large, recurved; snout bluntly rounded; eyes placed high, protrusible; interorbital space broad; opercular spine, 1, strong, concealed by skin; gill openings somewhat restricted, membranes broadly united to isthmus. Fins: dorsal (2), II—33 to 37, well separated, spinous fin small, low, in groove, rayed fin long; anal, 29 to 34, long; pelvic, 1, 2, thoracic, broad, rays much branched; pectoral large, broad; caudal, rounded. Lateral lines: 4, Scales: absent. Photophores: on body and head in rows of varying lengths, each in form of shiny round area covering minute lens. Pores: on head in several rows. Cirri: rounded to multifid; in pairs along lateral lines and along rows of pores on head. Colour: olive brown to dark iridescent blue on dorsal surface; silvery gray on sides; golden yellow on ventral surface; white space under eye with black crescent below; white on posterior margin of maxillary; dusky to black on margins of vertical fins.

Length to 15 inches.

Distinguished by the numerous rows of photophores or "buttons", the broad flat head, the prominent widely separated protrusible eyes and the small spinous dorsal fin.

The midshipman was first taken in British Columbia waters near Vancouver island by H.M.S. *Plumper* and the individual obtained was recorded in 1861 by A. Günther as *Porichthys porosissimus*. In 1920, B. A. Bean and A. C. Weed recorded the species from Ucluelet, collected in 1909, as *Porichthys notatus* Girard, and from Vancouver island, collected in 1915, as *P. margaritatus* (Richardson). The midshipman is common in the strait of Georgia and on the west coast of Vancouver island as far north as Nootka island. It is found frequently in the intertidal zone and ranges to depths of at least 145 fathoms. In the shoreward areas these fish may be found beneath rocks. The breeding season is in the spring and the large pale pink to yellow eggs are attached singly to the lower surface of a rock or shell until a large mass is formed. This mass is guarded carefully by the male and the fry emerge in early July, at which time they are about ⅜ of an inch in length, and are attached to the rocks by the outer wall of the yolk-sac. They remain thus attached for two or three weeks until the yolk is absorbed, after which the young fish, about one inch in length, become free-swimming. The food of the adults consists of fishes and crustaceans. The rows of photophores with fancied resemblance to buttons have suggested the name midshipman. This fish is known also as the singing-fish on account of the loud humming sounds which are produced by vibrations in the air-bladder.

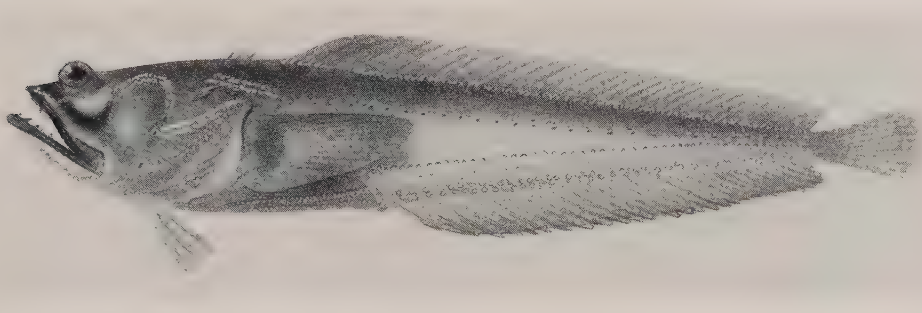

FIGURE 252. Midshipman. *Porichthys notatus* Girard 1854

Range southern California to southeastern Alaska.

Order PEDICULATI

In this order the body is broad, globular to greatly depressed. The gill openings are small and never in front of the pectoral fins. Scales usually are absent. The spinous dorsal fin is usually represented by one or more free spines, the first of which is situated on the head and may be subtended by a short globular luminous organ, or a long whip-like lure called an illicium; the pelvic fins, when present, are thoracic, with 1 spine and 5 rays.

The order comprises some sixteen families. While most species dwell on the bottom of fairly deep waters, or are bathypelagic, one or two are known to inhabit floating seaweeds.

Among the common names applied to these fishes are: angler, fishing-frog, monk-fish, sargassum-fish, sea-devil and bulb-fish.

Family ONEIRODIDAE Sea-devils

In the sea-devils the body is short, oval to globular. The mouth is large with acute depressible teeth. The rayed dorsal and anal fins are short and placed far back on the body and approximately equal in size. The skin is scaleless except in one genus, and usually black.

Bulb-fish *Oneirodes bulbosus* Chapman 1939

Body short, deep, broad, nearly globular; caudal peduncle, short. Head large, very deep, broad, pointed; mouth terminal, very large; teeth long, slender, depressible; snout long, acute; eye very small, somewhat protruded; interorbital space deeply concave to base of illicium; spines; sphenotic, 1, above and behind eye; gill membranes joined to body, gill opening small, below and behind pectoral fin. Fins: dorsal (3), I—1-5, first fin, known as illicium, elongate, arising from snout, jointed anterior thereto, cirri at tip, 4, three much branched, one posterior, curved, unbranched, second fin a single lax fleshy ray above gill opening, third fin far back on body, directed backward; anal, 4, similar to third dorsal;

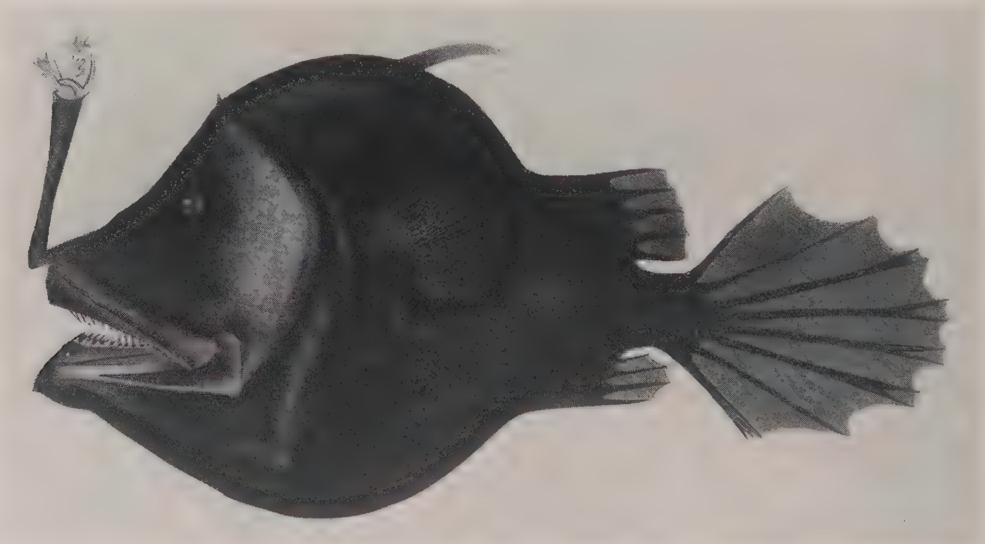

Figure 253. Bulb-fish. *Oneirodes bulbosus* Chapman 1939

pelvic, absent; pectoral, 13, high on body; caudal, large, fan-shaped. Lateral line: absent. Scales: absent. Colour: jet black; pale on bulb and appendages of illicium.

Length to 3¼ inches.

Distinguished by the almost globular shape of the body, the jointed illicium on the snout, the small eyes, the small gill openings below and behind the pectoral fins and the jet black coloration.

The bulb-fish is known from a single specimen taken March 11, 1934, west of Graham island by the International Fisheries Commission, station 1109C. lat. 53° 50′ N., long. 133° 54′ W., in a vertical haul at a depth between 487 and 379 fathoms. This specimen, the type, and only one known, was described in 1939 by W. M. Chapman and is now in the collection of the United States National Museum.

Range Queen Charlotte islands.

GLOSSARY OF TERMS USED

Abdomen. Externally the ventral surface of the body, ordinarily between the pectoral fins and the anus.

Abdominal. Pertaining to the abdomen.

Abyssal. Pertaining to waters of great depths, below 1500 fathoms.

Accessory lateral line. See lateral line.

Adhesive disk. A modified portion of the external anatomy forming a sucker, *e.g.* around the mouth of the lamprey; the modified first dorsal fin in the whale-sucker; the pelvic fins in the liparids.

Adipose fin. A fleshy fin on the dorsal median line of the body behind the rayed dorsal fin, as in the salmons, smelts, etc. Technically a dorsal fin but for convenience because of its fleshy nature, without rays, it is referred to in the text and key as a separate fin.

Anal. Pertaining to the anus.

Anal fin. The fin on the ventral median line of the body behind the anus.

Anal papilla. A protuberance in front of, or bearing, the genital pore, behind the anus in certain groups of fishes, functioning as a penis, *e.g.* in certain sculpins, etc.

Anterior. In front.

Anus. The posterior opening of the digestive tract, sometimes referred to as the vent. Varying in position from near the posterior end of the body, as in the hag-fish, to below the lower jaw, as in the tadpole liparid. More usually found in the middle third of the body on the ventral surface.

Asymmetrical. Not symmetrical: one side not the mirror image of the other, *e.g.* the body and head of a flounder.

Barbel. An elongate fleshy projection under the snout, around the mouth or below the lower jaw, as in the sturgeons, cods, etc.

Base of fin. The area of contact of a fin with the body; the distance from the first ray or spine to the last ray or spine.

Bathypelagic. Living freely in open waters below 200 fathoms.

Bifid. Having a forked end, as of the preopercular spine in some members of the family Cottidae.

Bifurcate. Divided into two branches.

Body. That portion of a fish between the head and the base of the caudal fin.

Branchial. Pertaining to the gills.

Branchiostegal membrane. The membrane enclosing the gill chamber ventrally. Also called gill membrane.

Branchiostegals. The bony rays which support the branchiostegal membrane.

Buccal. Pertaining to the mouth, *e.g.* the buccal or mouth cavity.

Caecum (*pl. caeca*). A blind sac, *e.g.* the pyloric caeca, connected with the anterior portion of the intestine. Used in the identification of the salmons and liparids.

Canines. Teeth that are enlarged and conical.

Cardiform teeth. Teeth that are small and sharp, arranged like a series of combs, or like wool cards.

Caudal. Pertaining to the tail, as caudal fin, caudal peduncle, etc.

Caudal peduncle. The posterior end of the body upon which rests the base of the caudal fin. Usually considered as the part of the body from the posterior margin of the anal fin to the end of the vertebral column.

Chondrocranium. A cartilaginous skeleton enclosing the brain, as in the sharks, rays, etc.

Claspers. Extensions of the pelvic fins in male sharks, skates, etc., for the transference of sperms to the female.

Cleithrum (*pl. cleithra*). A bone forming the dorsal, and usually anterior, part of the pectoral girdle.

Compressed. Flattened from side to side.

Confluent. Meeting smoothly without a notch.

Corselet. A patch of scales posterior to the base of the pectoral fin of some members of the mackerel family.

Cranial. Pertaining to the brain case or skull.

Cranial ridge. A bony ridge on the top of the skull.

Cranial spine. A spine on the skull.

Crenulate. Scalloped.

Cusp. A projection or point on the crown of a tooth.

Deciduous. Falling off; loosely attached.

Decurved. Curved downward; said of a lateral line which curves downward from its origin to or below the mid-lateral position.

Depressed. Flattened from above downward.

Dentary. The bone forming the anterior portion of each half of the lower jaw.

Dentary elevation. An elevation at the symphysis or junction of the dentary bones which may fit into an emargination between the symphysis of the premaxillary bones of the upper jaw.

Denticles. Minute teeth; tooth-like growths.

Dentigerous. Bearing teeth.

Dentition. Having reference to the arrangement and character of the teeth.

Depth of the body or head. The vertical distance through the body or the head at its greatest distance dorsoventrally, not including the fins.

Dermal. Pertaining to the skin.

Diameter of eye. The greatest diameter of the orbit or eye-socket.

Distal. Farthest away; most distant.

Dorsal. Pertaining to the upper surface or back.

Dorsolateral. Refers to the position of the area or line where the back and side meet.

Elongate. Lengthened; longer than deep; very long.

Emarginate. Having the margin notched.

Embedded. With reference to scales: the scale margin is so enveloped in skin that there is no free edge, *e.g. Pleuronichthys,* the scales appear as if punched into the skin.

Exserted. Fin rays much projecting beyond the fin membrane. Usually used with reference to pectoral fin rays.

Falcate. Sickle or scythe-shaped; long, narrow, curved.

Filament. A thread-like projection, *e.g.* the very elongate first spine of the dorsal fin of *Icelinus filamentosus.*

Frenum. The fold of skin joining the lower lip to the symphysis of the lower jaw, as in some members of the family Embiotocidae.

Furcate. Forked.

Fusiform. Spindle-shaped; tapering towards each end but rather more abruptly anteriorly, *e.g.* the mackerels.

Gill. The structure by means of which gases are exchanged between the blood of the fish and the water environment.

Gill arch. The bony support to which the gill filaments and gill rakers are attached.

Gill chamber. The space around the gills enclosed by the operculum and the gill or branchiostegal membranes.

Gill filaments. The slender delicate fringe-like structures composing the gill.

Gill membrane. The membrane supported by the branchiostegal rays, which closes off the gill chamber, in part. Also known as the branchiostegal membrane.

Gill membranes separate. The gill membranes are free from one another posteriorly.

Gill membranes united. The membrane covering the gill cavity on one side is united to its fellow of the opposite side to form a fold over the isthmus, (the forward pointed projection of the body).

Gill membranes, free from isthmus. The membranes are free so that a needle may be run across the isthmus from side to side under the gill membranes posteriorly.

Gill membranes, joined to isthmus. The membranes are attached laterally or ventrally to the isthmus.

Gill rakers. The protuberances on the gill arch opposite the gill filaments; these are short and usually rough in carnivorous fishes, long and very slender in plankton-feeding fishes. The formula 15 + 25, indicates 15 rakers on the upper limb of the arch and 25 on the lower.

Girdle, pectoral. The internal bony or cartilaginous structure supporting the paired pectoral fins.

Girdle, pelvic. The internal bony or cartilaginous structure supporting the paired pelvic fins.

Heterocercal. Referring to a caudal fin in which the upper lobe is longer than the lower and encloses the end of the vertebral column.

Homocercal. Referring to a caudal fin with the upper and lower lobes of equal, or nearly equal, length.

-id (suffix). Indicating a member of a family, a non-scientific terminology, *e.g.* salmonid, a salmon; cottid, a sculpin.

-idae (suffix). Indicating a family, a scientific terminology, *e.g.* Clupeidae, herrings.

Illicium. A whip-like structure on the head derived from a modified dorsal fin spine or ray, sometimes luminescent.

Imbricated. Overlapping, referring to the scales of a fish.

Incised. Cut in, referring to the membranes between the tips of the rays or spines of a fin.

Included. Said of a lower jaw which is overlapped by the upper.

Inferior. Below; not terminal, *e.g.* the mouth of a sturgeon and some agonids.

Insertion of a fin. The posterior end of the base of a fin.

Interorbital space. The least width of the skull between the eyes. In the Scorpaenidae the interorbital space is broad when it is 4 or less in the length of the head; medium width, 4 to 5 in length of head; narrow, 5 or more in length of head. The shape, (convex, flat or concave), refers to the portion of the skull between the eyes and not including the cranial ridges or spines.

Interspace. The space between vertical fins, usually referring to dorsal fins.

Isthmus. The narrow triangular portion of the body beneath the head and between the gill chambers.

Keel. A ridge extending longitudinally along the midline of the side; on the caudal peduncle of certain sharks, on the scales of certain fishes such as the shad and the darter sculpin, etc. On the middorsal line of the head in gobies, etc.

Lamina. A small thin plate.

Lanceolate. Shaped like the blade of a lance, *e.g.* the caudal fin of the rat-fish.

Larva. The early stage after hatching from the egg, frequently different in appearance from the adult.

Lateral. Pertaining to the side.

Lateral line. A sensory canal along the side of the body with a series of pores opening to the exterior. The lateral line may be single or multiple.

Lateral line pore. One of a series of openings from the sensory lateral line canal to the outside.

Lateral line with accessory dorsal branch. The lateral line system beginning on the head has an extra or accessory dorsal branch passing above the main lateral line more or less close to the dorsal fin, *e.g.* in certain blennies, greenlings, flat-fishes, etc.

Littoral. Along the shore; shore-dwelling.

Luminous organ. A specialized area on the body or head, capable of producing light, without a lens and usually irregular in shape.

Lunate. Having the shape of a half moon; a broadly rounded, rather shallow fork.

Mandible. The main bone forming the lower jaw.

Maxillary. The main bone forming the upper jaw.

Median. Situated on the vertical axis of the body.

Metamorphosis. Change in body structure or form; having reference to marked changes occurring in fishes during development from the larval to the adult stages.

Molar. An enlarged tooth for grinding or crushing.

Mouth oblique. The mouth is modified so that the jaws, when closed, are not in a horizontal position, *e.g.* some blennies.

Mouth subterminal. The mouth is almost at the anterior tip of the head and opens anteriorly, *e.g.* anchovy, grenadiers.

Mouth terminal. The mouth is at the anterior end of the head.

Mouth ventral. The mouth is located far behind the tip of the head and opens ventrally, *e.g.* sharks, sturgeons.

Muciferous. Carrying mucus.

Mucous. Slimy. The adjective of mucus.

Mucus. A slimy secretion from the skin.

Multifid. Having many branches or forks.

Nasal. Pertaining to the nose.

Neural processes. Broad plate-like structures arising dorsally from the vertebrae, exposed in the silvery hatchet-fish.

Notch. In the case of the dorsal and anal fins, an indentation partially dividing the fin into two parts, *e.g.* rock-fishes; in the case of the pectoral fin, a broad indentation resulting from the shortening of some of the rays thus dividing the fin into two lobes, *e.g.* black-finned eel-pout.

Occipital. The most posterior bone on the top of the head; pertaining to the occiput.

Occiput. The posterior portion of the upper part of the head; in some fishes the cross line separating the head from the body, *e.g.* some blennies.

Ocellus (*plural, ocelli*). An eye-like spot, *e.g.* big skate.

Ocular. Pertaining to the eye.

Operculum. Gill-cover. Supported by the following bones: opercle, preopercle, interopercle, subopercle.

Orbit. The eye socket.

Orbital. Pertaining to the orbit of the eye.

Origin of a fin. The anterior end of the base of a fin.

Palatines. A pair of bones on the roof of the mouth, one on each side, extending outward and backward, from the head of the vomer, sometimes bearing small teeth.

Papilla. A small fleshy projection, sometimes tubular.

Pectoral. Pertaining to the pectoral girdle, the pectoral fins or the area adjacent to the pectoral fins.

Pedicel. A small or slender support for a larger structure, *e.g.* the oral cirri of the sturgeon-like sea-poacher.

Peduncle. See caudal peduncle.

Pelagic. Living freely in open waters.

Pelvic. Pertaining to the pelvic girdle, the pelvic fins or the area adjacent to the pelvic fins.

Peritoneum. The lining of the abdominal cavity.

Pharyngeal. Pertaining to the region of the pharynx.

Pharynx. The region posterior to the mouth into which open the internal branchial clefts.

Photophore. A specialized organ, on the body or head, capable of producing light, usually with a lens and round reflector.

Plankton. Minute aquatic plants and animals, sometimes microscopic.

Plications. A series of small folds.

Posterior. Behind.

Premaxillary. One of two bones, on either side of the midline of the upper jaw, immediately in front of the nasal bones, sometimes overlapping the maxillary bone laterally.

Preopercle. The bone in the operculum in front of the opercle.

Preopercular spine. A bony protuberance from the preopercle. The spine, or spines, may be barely discernible to very elongate, simple or multifid.

Prickle. A scale reduced to a sharply pointed spine.

Procurrent fin. The base of the fin is broad and curved forward and the lowest ray is inserted well forward, as in the pectoral fin of some cottids, *e.g.* the spiny-headed sculpin.

Profile. The contour of the body or head, from the side view unless otherwise stated.

Protractile. Capable of being extended forward, *e.g.* premaxillary and maxillary bones.

Protrusible. Capable of being thrust forward or outward, *e.g.* the mouth of a sturgeon.

Pyloric caeca. See caecum.

Ray. In this text the term, when applied to a fin, refers to the segmented support to the fin membranes, the segmentation usually being visible by transmitted light, (sometimes referred to as "soft" rays by authors).

Recurved. Curved upward and inward, *e.g.* the preopercular spine in the sharp-nosed sculpin.

Reticulations. Markings in the form of a network of lines.

Rostral. Pertaining to the snout.

Rostral plate. A small plate on the anterior tip of the snout, as in some sea-poachers.

Rostral spine. A spine on the rostral plate.

Serrat - ed. Notched like a saw.

Sessile. Attached without a stem or pedicel.

Snout. The portion of the head which projects in front of the eyes.

Snout, rounded. Usually referring to the dorsal aspect.

Spine. In this text the term when applied to a fin refers to the unsegmented supports of the fin membranes regardless of whether or not they are stiff.

Spinule. A small spine, *e.g.* on the uppermost preopercular spine of some cottids.

Spiracle. The opening behind the eye of a shark or ray connected with the branchial chamber and through which water may be taken and passed over the gills.

Stellate. Star-like; ridges or lines radiating from a central point; said of the tubercles on the starry flounder.

Striae. Fine lines or ridges, as on the opercula of some fishes, *e.g.* the pilchard and eulachon.

Subequal. Not quite equal.

Suborbital. Below the eye.

Suture. A line of junction between two immovably connected bones.

Symmetrical. Having symmetry. Each side a mirror image of the other.

Symphyseal knob. A projection or swelling below and in front of the symphysis or point of junction of the two dentaries or lower jaw bones.

Symphysis. Point of junction of two bones, *e.g.* the two dentaries or lower jaw bones.

Synonymy. A list of technical names which have been applied to certain species. Occasionally the same species has been described independently by two or more scientists. In this case the name which was first applied, in 1758 or subsequently, must be given priority. The later names are then said to go into synonymy.

Tail. The part of the body posterior to the body cavity; in most fishes this is applied to the caudal peduncle and fin inclusive.

Terete. Round in cross section, *e.g.* lamprey, pilchard, barracuda, etc.

Terminal. At the end.

Thoracic. In the region of the thorax, or "chest".

Truncate. Ending abruptly or square-cut, as the tails of some fishes.

Tubercle. A modified scale, sometimes represented by a hard or soft excrescence, or a small rounded hump.

Tuberculate. Covered with tubercles.

Type locality. The particular locality in which a type specimen was collected.

Type specimen. The particular specimen upon which was based the original description of a species.

Ventral. Pertaining to the lower surface of the body or head.

Ventrolateral. The area in which the side and ventral surfaces meet.

Vermiculations. Fine lines more or less worm-like in shape.

Villiform teeth. Very small slender teeth, crowded into bands or patches.

Vomer. The bone in the roof of the mouth immediately behind the premaxillaries, frequently bearing teeth.

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